

JOURNAL

OF THE

ASIATIC SOCIETY OF BENGAL.



Part II.—NATURAL SCIENCE.

No. IV.—1891.

XII.—*Natural History Notes from H. M.'s I. M. Survey Steamer "Investigator," Commander R. F. HOSKYN, R. N., Commanding—No. 25. The Vegetation of the Coco Group.—By D. PRAIN.*

[Received—Oct. 23rd; read—4th Nov. 1891.]

§ INTRODUCTORY.

The Cocos are a small group of three islands, Table Island, Great Coco, and Little Coco, lying about 30—45 miles north of Landfall Island, the most northerly of the Andaman group proper, in Lon. $93^{\circ} 21'$ E., Lat. $13^{\circ} 56'$ to $14^{\circ} 10'$ N., and form one of the links in the island-chain that stretches southwards from Cape Negrais in Arracan to the Nias Islands off the western coast of Sumatra.

The first link in this chain is Diamond Island, Lon. $94^{\circ} 18'$ E., Lat. $15^{\circ} 51'$ N., $\frac{1}{2}$ miles south of Cape Negrais and 130 miles north-north-east of the Cocos; the next is the island of Preparis, (not yet botanically investigated), larger than Diamond Island but smaller than the Great Coco, 80 miles south-south-west from Diamond Island and 50 miles to the north of the Cocos. The strait between Diamond Island and Preparis is somewhat under 100 fathoms, that between Preparis and the Cocos somewhat over that depth. The channel between the Great and the Little Coco is under 50 fathoms, a depth not greatly if at all exceeded in the passage between the Cocos and Landfall. The next link in the chain is the Andaman Group proper, extending from about Lat. $10^{\circ} 40'$ to

13° 45' N., consisting of several large islands that are separated by straits and channels which, with the exception of a passage 30 miles wide and about 100 fathoms deep between Rutland Island and Little Andaman, are all very narrow and usually quite shallow. Further south we find in the same chain the Nicobar Islands; these, separated by wider intervals than the members of the Andaman Group are, extend from 6° 45' to 7° 15' N. Besides being wider, the passages between the individual islands here are much deeper and the main channels between the Andamans and Nicobars on the one hand, and between the Nicobars and Sumatra or the Nias Islands on the other, in place of being under 150 fathoms deep, give soundings of 500, 750, and even 900 fathoms. There is, however, along the line from Little Andaman to the island of Simalu or to Acheen Head an undoubted ridge, for the floor of the Sea of Bengal to the westward is 2,000 fathoms deep, and that of the Andaman Sea to the eastward is in some places at as great a depth. Whether any portion of the now submarine sections of the southern, or Nicobars half of this ridge has ever been subaërial it is difficult to say but it seems likely from its present physiographical configuration that the most recent land connection must have been between the northern or Andaman half of the ridge and the adjacent Indo-Chinese district of Arracan.

Table Island, the most northerly member of the Coco group, and lying 45 miles north of Landfall, is about a mile across and is rather longer than broad, with a considerable outlying islet, Slipper Island, at its north-west corner; southward, across a strait about two miles wide, lies the Great Coco some 9 miles long from north to south and about $2\frac{1}{2}$ across at the widest part with several small islets off both its east and west coasts and with a very considerable outlying islet, Jerry Island, at its southern extremity; finally, some 6 miles south-west of Great Coco, and 30 miles north of Landfall, is the Little Coco about $2\frac{1}{4}$ miles long from north to south and $\frac{1}{4}$ to $\frac{1}{2}$ a mile wide.

Through the kindness of Capt. Hoskyn, R.N., the writer, in company with Dr. Alcock of H. M. I. M. "Investigator," has been able to visit the group on two occasions. On Nov. 30th and Dec. 1st, 1889, Table Island was examined. On Dec. 2nd, 1889, a naturalist's party, which the writer was privileged to join, landed on Great Coco and remained encamped on a small cleared hill in its north-eastern peninsula until Dec. 8th. From Nov. 14th till Nov. 23rd, 1890, a similar party, of which the writer again was a member, was encamped on a sandy spit covered with coco-nut trees at the south end of the island; while between Nov. 25th and Nov. 30th, 1890, the Little Coco was examined.

On Table Island is situated the well known lighthouse of this name and the western slopes of the main island as well as most of Slip-

per Island, which at low-tide is not separated from the main island, are cleared on account of some cattle of which the lighthouse-keeper has charge. Throughout the rest of the island, however, except for a few pathways that have been cut on account of the cattle, the jungle is very dense and uniform. Around a bay at the south side of this island as well as on the north coast is a fringe of coco-nut trees. The height of Slipper Island is 110 feet; the highest point of Table Island proper is 150 feet. On the occasion of the visit referred to, the eastern half of the island, where the jungle is as yet intact, was traversed from south to north; the northern and western coasts were examined; the island was traversed from west to east along one of the cattle paths; the clearing was also examined for introduced weeds and escapes from cultivation.

On Great Coco Island there is a small clearing on a peninsula that forms the north-eastern extremity of the island, the site of an abandoned settlement which, some years ago, it was attempted to effect and where the writer was encamped during his first visit. Except at this point and on two or three of the more exposed cliffs and slopes on the western sea-face of the island, which are only grass-clad, there is a uniform jungle from end to end of the island and from base to summit of the numerous more or less parallel steep ridges that compose it. The shore is fringed with coco-nut trees in quite a thin belt where the ridges that compose the island come close to the shore, and this fringe is broken here and there where these ridges end in abrupt headlands; the belt widens however at the heads of the various bays and in two places in particular,—on the eastern side of the island along the bay that extends southward from the north-eastern peninsula already mentioned, as well as across the isthmus joining this peninsula to the main island and thence along the northern end of the island to the mouth of the principal creek—again, on the western side of the island for half a mile or more northwards from the southern end—this belt of coco-nut trees is 100 yards or more in width. Where the beach meets the coco-nut belt there is an invariable sea-fence of *Pandanus* with other ordinary Indian Ocean littoral plants; this fence is generally less dense where the beach is composed of sand than when it consists of coral shingle. Except on the very crests of the ridges, and sometimes even there, and on the more exposed western headlands, the forest is composed of very tall trees with below these a dense undergrowth; this undergrowth is particularly dense, owing to the number of creepers, on the crest of ridges destitute of tall trees, and on the slopes of the western sea-face that are not grassy. It is also very dense immediately behind the coco-nut belt especially if, as frequently happens, this belt passes insensibly into the mudflats that characterise the outskirts of a mangrove swamp. On the sides of ridges however, as

opposed to their crests, the under-jungle is not so dense, largely owing to the mass of creepers being carried up to the tall trees above, while on the neck of land that connects the main island with the peninsula at the north-east corner, and on the narrow, more level tongue that forms the south end of the main island and stretches towards Jerry Island, the jungle is rather opener and more penetrable than elsewhere. The height of the outlying north-eastern peninsula which probably at one time has been a separate islet, at least at high-tide, is 80 feet; the highest ridge of the main island has an elevation of 300 feet; the other ridges mostly reach from 150—200 feet. Jerry Island, the chief outlying islet off Great Coco, consists at the southern end of a low ridge 60 feet high with a vegetation quite like that of the ridges on the main island; the northern half, however, consists of a level spit stretching towards the main island; this spit is composed of coral-shingle, and though covered with coco-nut and other trees there is only a sparse undergrowth within its *Pandanus* belt. Between Jerry and the main island extend wide sandstone reefs on which the waves and currents have thrown up a small eyot of sand, coral-shingle, dead shells, and drift timber on which stranded fruits and seeds are germinating. The other outlying islets call for no remark; all of them look like detached continuations of particular ridges and most of them have the vegetation characteristic of these. During the first visit daily excursions were made into the island towards the northern and eastern parts; the jungle was found to be so dense on the ridges and the level ground so difficult owing to the ramifications of a considerable creek, which, with its concomitant mangrove swamps, finds an outlet into the northern bay, that it was only on one occasion that the western coast was reached. It was impossible to do anything like justice to the interior; still, the northern and north-eastern peninsulas, the northern half of the east coast, the north coast and about two miles of the west coast at the north end were fairly thoroughly examined. During the second visit, profiting by the experience of the former season, fewer attempts were made to force a passage in a straight line through all obstacles, and the edges of ridges—*juga ipsissima*—were in particular carefully avoided. The compass was discarded, no particular objective in the shape of a hill visible from the sea-shore was permitted to occupy the attention exclusively; the easiest rather than the shortest road was chosen as the route to be followed. In this way the island was crossed in four or five different places, all, however, towards the southern end; the west coast was explored for about four miles and the east coast examined northwards as far as the point reached when working in the opposite direction in the previous year. The outlying islet, Jerry, was also examined fairly thoroughly and its coasts skirted.

Little Coco consists of several ridges the highest having an elevation of 200 feet. The ridge jungle is much as in the other islands, but the level land is more largely composed of a basis of coral-shingle than is the case in the other two islands and the undergrowth is not quite so dense as in the level land on Great Coco. The coco-nut fringe is quite as uniform as in the Great Coco, but there is only one point,—at the head of a shallow bay in the middle of the west coast,—where the belt is as much as thirty yards wide. During his visit to this island the writer was able to cut his way from west to east across the highest ridge; to cross in another part along more level and frequently swampy ground; to work through a lagoon that occupies the south-western part of the island, and to skirt the whole coast on two different occasions.

The islands have all the physical features of the Andaman islands of the main chain as opposed to those of the Archipelago lying to the north-east of Port Blair; the rocks indeed recall at once those of Ross Island and of the shores of Port Blair in South Andaman. They are also equally like those forming Diamond Island, off the Arracan coast at the mouth of the Bassein river and, as in these localities, are best seen at points where the inland ridges end in abrupt headlands or are continued as long reefs exposed wholly, or in part, at low-tide.* Such reefs not infrequently rise into outlying islets. These islets are some distance from the main island, and are bare and rocky, or jungle-clad, according to size and exposure, those off the west coast being all very bare. The bays between the headlands are mostly wide and shallow, and are filled up, except opposite the mouths of creeks, with an accumulation of coral debris that becomes at times banked up, causeway-like, between the shore and an outlying island; these causeways are in some instances becoming stocked with the mangrove-vegetation of the neighbouring creeks.

The floor of these shallow bays is remarkably flat and uniform and is, at the sea-edge of the bay where the reef ends, generally rather shallower than it is within, so that at low-tide each bay consists of a long shallow pool, one to two feet deep, separated from the sea itself by a long low bank of exposed coral. The bottom of such a pool is usually covered by a close meadow of *Cymodocea ciliata*, but though this species is so common there seems to be no other marine phanerogam present. *Algæ*, too, are remarkably inconspicuous, being of small size and very

* For further notices of the physiography of the islands the reader is referred to Alcock; *Nat. Hist. Reports in Hoskyn, Administration Reports of the Marine Survey of India* 1889-90, pp. 14, 15; 1890-91, pp. 11, 12; where also notices of the fauna, particularly marine, will be found. In Hume; *The Islands of the Bay of Bengal in Stray Feathers*, vol. ii, pp. 111—119, an account of these islands will also be found; there the ornithology of the group is exhaustively discussed.

scarce; the only exceptions are *Turbinaria ornata*, which is fairly frequent both on the coral reefs and on the sandstone ledges; *Padina pavonia*, more common on the exposed sandstone reefs but less frequent on the coral than *Turbinaria*; and *Sargassum ilicifolium*, which is the only really common seaweed and which occurs in great meadows at the outer margins of the fringing reefs and sandstone ledges that are exposed at low-tide, as well as in the deeper water beyond.

Reefs such as those described are extremely common in all the islands of the Andaman and Nicobars groups that the writer has visited, and the marine vegetation is remarkably uniform in appearance as well as in specific constituents. On Car Nicobar, for example, as well as on Rutland Island, at the extreme south end of the Andaman main group, localities which the writer has visited on different occasions, it is hardly possible to detect a species not represented on the reefs of the Cocos. On similar reefs in South Andaman, however, a second species of *Cymodocea*, quite as profuse where it exists, but more local in its occurrence, has been gathered, and on a similar reef in Little Andaman large meadows of *Halophila ovalis* were found associated with those of *Cymodocea*. The beach between such a reef and the *Pandanus* sea-fence consists, so far as the writer's observations extend, almost exclusively of coral sand mixed with small shells or fine fragments of large shells. The heavy surf in such a bay as this breaks at the outer margin of the reef, and even at high-tide in rough weather the swell is so weakened there that the waves which break on the beach are not so heavy as to have any great erosive power. Indeed their effect appears to be on the whole accretive, for the sand that accumulates at the head of the bay becomes bound by *Ipomœa biloba*, *Sesuvium*, *Euphorbia Atoto*, etc., the *Pandanus* fence encroaches on the beds of *Ipomœa*; the coco-nut zone widens seawards, and behind it the first line of beach-forest, containing *Terminalia*, *Hernandia*, *Erythrina*, *Pongamia*, *Stephegyne*, *Thespesia*, and the second line of the same forest, characterised by *Mimusops*, *Gyrocarpus*, *Pisonia*, *Ardisia*, *Cycas* assert themselves in an area previously covered by the tides. In certain situations, too, the true mangroves stalk forward into the tolerably quiet waters of these bays, while in a different but equally effective manner, by sending up suckers from among its curious pith-like roots, *Avicennia* establishes itself upon the reef. The guyed and stilted habit of the former makes their position very secure; the latter, from the enormous area covered by its roots, must also be difficult to overthrow. The process of land-making behind a fringing reef, either as a sandy flat covered with coco-nut trees, or as a mangrove swamp spreading seawards, is well exemplified in the two bays lying respectively to the south and to the north of the position of the first season's

camp; the effects are so like what must result if land were slowly rising that it is only after careful examination of all the conditions that one's mind becomes disabused of this specious impression. There is no direct evidence that the land is rising and, as will be evident on considering what has been said above, there is no necessity for supposing that it is. But though this is a very common type of bay, it is not the only type. On Great Coco, in some cases, and on Little Coco very generally a different stage may be observed. The shallow pools described as existing between the surf-built embankment at the margin of the fringing-reef and the beach, have in them many living corals that raise great rings which rise to almost the surface of the water in the pool at low-tide and, like huge lichens, grow peripherally till they meet and coalesce. The surf, too, breaks off pieces of greater or smaller size which are lodged in the pool behind, and by-and-bye become more or less cemented together. In this way the whole of a pool becomes in time completely filled up with growing coral and cemented blocks, and there are many reefs, especially on Little Coco, that are completely uncovered at low-tide, while small patches of similar reef are here and there seen that ordinarily the high-tides do not cover. The uniformity that the surfaces of some of these exposed reefs display is very striking. They are almost as even as a paved floor and are as bare and destitute of marine vegetation as they are of living coral. The edge of such a reef, in place of being a fairly continuous embankment higher than the floor of the bay behind, is now broken into hundreds of jagged gulleys through which the wave-wash from the almost level platform tears its way back to the deep water beyond the fringing-reef. The main interest of this stage of the reef is less, however, from the present point of view, its actual physical condition than its effect on the vegetation of the shore.

Behind a coral bay like one of those first described, and which characterises a less advanced stage of the history of the fringing-reef, has gone on a long and steady growth of land, with some shingle in it doubtless, especially as one approaches the nearest ridge, but chiefly composed of coral sand with a thin coating of humus derived from the vegetation it has supported. The main force of the surf has for long been spent on the outer embankment, and the force of the waves that at high-water passed over its top has been so much diminished ere these reached the beach that there they did not act destructively. Now all this is altered. At low-tide the force of the surf is still all expended on the edge of the reef, but as soon as the water has risen so high that the edge of the reef is covered, this force instead of being dissipated in the deeper water of a pool is accentuated as the breakers roll landward across a reef on which the water shallows slightly as the shore is approached; by the

time the surf ceases to break on the edge of the reef practically its whole force rolls in over this even and slightly shallowing reef till it falls on the shore in huge erosive breakers that eat away the soil, so that *Pandanus* fence, coco-nut zone, and beach-forest all in turn disappear, and the waves at high tide grind on the prostrate stems of huge *Mimusops*, *Ficus Rumphii*, and *Dipterocarpus* trees, and undermine the roots of their old companions that are still standing but that the next storm will lay beside those on the beach. But this active denudation no more indicates a sinking of the land than do the heightened reefs that cause the action indicate that the land has risen, and as direct indications either of rising or of sinking are altogether absent we must conclude that the islands are at present practically stationary. But it is interesting to find, as one does here, in adjacent bays, such diverse indications of the same condition.

There are bays of a third type in the group, few in number, however, and of small size, in which the water is deep quite up to the beach; the sweep of the waves in these is extremely large, even when the sea outside is quiet, owing to the strong currents that prevail round the islands. They have all, as might be expected, rocky sides; the beaches on which the waves break are of sand, not shingle, and owing apparently to this excessive sweep of the waves the *Pandanus* fence and coco-nut zone at the head of such a bay is a good number of yards away from the beach, a considerable sand-bank covered with *Ipomœa biloba*, *Vigna lutea* and other sand-binding species, intervening between the limits of ordinary tides and the woody vegetation.

The nature of the beaches behind the numerous long, comparatively flat sandstone ledges, exposed at low-water and therefore not coral-covered, has yet to be noted. Such beaches are always of coral-shingle mixed with large shells, the pieces of coral being rounded or oblong and sometimes of considerable size. The most remarkable example of such a beach in this group is that at the south end and south-east corner of Little Coco where the sandstone reef is particularly extensive and where the south-west monsoon must break with singular force. This beach consists of an abrupt shingle wall, in many places 6 or 7 feet high, and yet not much wider at the base than twice its own height. Though very steep towards the sea-face it slopes more gradually at the back; behind it at this point there stretches a low flat tract of muddy land not much higher than the reef itself, covered by a dense jungle of *Hibiscus tiliaceus*, *Vitex Negundo*, *Leea*, and similar shrubs, but with few trees, the whole loaded with tangled masses of *Cassytha*. The *Pandanus* fence is here particularly dense, and along with it are coco-nut trees growing on the shingle; from the appearance and size of these it seems clear that, slight

as the defence seems, this shingle beach completely prevents erosion though at the same time accretion is probably very slow. In the case of the highest and most advanced coral reefs usually the same shingle beach occurs; from which fact we might conclude that as the initial stage of any fringing-reef must have been that of a simple submerged sandstone ledge of greater or less extent, we see here the original shingle beach, thrown up where this ledge originally became subaërial, to which the waves have eaten back over the present raised reef until all the sandy soil formed during the earlier "embankment and pool" stage has, with the vegetation it supported, been swept into the sea. This shingle having been reached the erosive action has been checked, and the surer, if slower process of shingle accumulation has been initiated or, at all events, renewed. From this account of these bays it will be seen that the fringing-reef exhibits in some parts a phase more advanced than it exhibits in others. But it does not therefore follow that these more advanced "platform" portions are older than the earlier "embankment and pool" portions. They cannot, in one sense, be so old, for we must suppose that all these reefs commenced contemporaneously, and the "embankment and pool" reefs are still growing, whereas the "platform" reefs have now no living coral. The different stages therefore merely indicate that the sandstone reefs running out from the headlands in which the various ridges end are in different parts of the islands situated at different depths, and the condition of the reefs indicates that the sandstone ledges are shallower, and that deep water is further from the shore towards the south than towards the north end of the islands. At quite the southern extremity of Little Coco bare sandstone reefs, too shallow for the growth of a coral fringing-reef, stretch away south-eastward in much the same way as the well-known Alguada reefs extend southward off Cape Negrais. On the east coast of Little Coco are high coral reefs exposed at low-tide, fringed by a coral-shingle beach, while towards the north end of the island are similar high reefs fringed by a shore of sandy soil which, with the beach-forest growing on it, is being washed away by the sea. On the west coast, where the reefs are high, and, though still in the "pool" stage appear from their jagged edges to be approaching the "platform" stage, a line of low sand-dunes, perhaps the highest development of the epoch of sand-accretion, have been thrown up; these at present protect the shore and have actually closed up, at the south-west corner, the mouth of a mangrove-creek.

Similarly, in Great Coco, near the southern extremity and between the main island and Jerry there is a large bare sandstone reef which exhibits very well the arrangement and dip of the strata; further up the east coast denudation is going on, still further north the site of a beach-

forest is being composed by accretion, while at the north end a mangrove forest is invading the sea. The west coast of Great Coco is more or less rocky and abrupt, for nearly the whole extent of the island.

No denudation is taking place in Table Island, the shores of which rise rather abruptly from the beach in most of its circumference, though there is a bay at the north side looking towards Slipper Island that is fringed with *Pemphis acidula* and has a small flat space immediately within its *Pandanus* fence.

When the beach between the reef and the *Pandanus* sea-fence consists of coral sand it is usual to find outside the jungle proper a belt of *Ipomœa biloba*, at times covered with parasitic *Cassytha*; where it is composed of shingle *Ipomœa biloba* may also occur, though it is more usual to find its place taken by *Ipomœa denticulata*. Along with these *Ipomœas* occur *Euphorbia Atoto* and, less frequently, *Sesuvium Portulacas-trum*. Usually just within these occurs the common sea-face jungle-fence of *Pandanus*, *Sophora tomentosa*, *Caesalpinia Bonducella*, *Tournefortia argentea*, *Desmodium umbellatum*, *Premna integrifolia*, *Olerodendron inerme*, *Colubrina asiatica*, *Canavalia obtusifolia*, *Vigna lutea*, *Guettarda speciosa*, *Allophylus Cobbe*, etc., and then, particularly if the beach is a shingle one, as trees in the same zone, *Ixora brunnescens*, *Terminalia Catappa*, very common, *Stephegyne diversifolia*, *Thespesia populnea*, *Hernandia peltata*, *Erythrina indica*, *Pongamia glabra*, *Ficus Rumphii*, *Barringtonia speciosa*, *Gyrocarpus Jacquinii*, etc., with a thin line of *Cocos nucifera* growing up slantingly beneath these and stretching their crowns seawards as if in search of light. Where the beach is sandy the sea-face jungle makes a less dense hedge, and within it lies a flat space of sandy soil with a grove of *Cocos nucifera*, stretching back from 10 to 100 yards to where, usually on lower and muddy ground tunnelled by *Cardisoma* and other land-crabs, commences a dense jungle that shades off almost insensibly into the vegetation of a true mangrove-swamp. The sand beneath the coco-nut trees in these groves is covered in Great Coco by a close sward of *Thuarea sarmentosa*, with here and there patches of *Ipomœa biloba*, clumps of *Tacca pinnatifida*, or large examples of *Crinum asiaticum* and *Cycas Rumphii*, and with patches of *Eranthemum* here and there beneath these. The more rocky portions of the coast have in the sea-face jungle-fence described above some other species that do not seem to care for sand or shingle, such as *Hibiscus tiliaceus*, *Tabernæmontana crispa*, *Desmodium polycarpon* and *Desmodium triquetrum*, *Briedelia*, *Derris uliginosa*, *Pluchea indica*, etc. Within the coco-nut zone on the flat land we meet with more *Gyrocarpus Jacquinii*, with the Andamanese Bullet-wood (*Mimusops littoralis*), various species of *Dipterocarpus*, *Miliusa* sp., common, and some species of *Meliaceæ*; the climbing undergrowth in this tract

is very characteristic, more so than the trees, consisting of *Cesalpinia Nuga*, *Capparis sepiaria*, and, very largely, of *Pisonia aculeata*. In the more muddy soil which occurs on the outskirts of the mangrove-swamps other shrubs and creepers occur; such as *Leea sambucina* with stilted roots like the mangroves, *Cynometra ramiflora*, *Hibiscus tiliaceus*, *Flagellaria indica*, *Mucuna gigantea*, remarkably common, *Sarcostigma edule*, *Plecosperrum andamanicum*, *Antitaxis calocarpa*, *Salacia prnoides*, which extends also into the swamp proper, *Acrostichum scandens*, etc. Not infrequent in such situations, when there is no high forest overhead is *Vitex Negundo* which is particularly common on Little Coco. In this muddy tract the tall trees remain much the same as in the drier area just behind the beach. Further inward the vegetation is that characteristic of a true mangrove swamp, *Bruguiera*, *Ceriops*, *Rhizophora*, *Aegiceras*, *Avicennia*. The *Avicennia*, strangely, does not appear to be common in many of the creeks, though there is one creek, on the east side and near the south end of Great Coco, in which it is the prevailing tree; except indeed for a few *Bruguiera gymnorrhiza* trees along the open channel of the creek, the whole swamp consists of *Avicennia officinalis* with thousands of its curious roots protruding through the mud and water as described already in a former paper (*J. A. S. B.* vol. lix, p. 272); considering the situation and loose structure of these roots, which are of the consistence of *solah*-pith, there seems every possibility that they are concerned in the process of transpiration; the large area covered by the roots of each tree must also afford great stability to a species which affects, as this one does, the situation of the mangroves without having their stilted roots. In this particular swamp each tree was loaded with the climbing form of *Salacia prnoides* and, as the latter happened to be in flower at the time of the visit, the foetid nature of the atmosphere experienced may be imagined.

Between the headlands, in most cases, a choked-up creek is to be found; generally this extends but a short way into the jungle, though sometimes it winds about on the level ground for a considerable distance as a mangrove-swamp. In two places the creeks on Great Coco are apparently open at all times to the tide; the chief creek is that which debouches at the north end of the island. There are no open creeks in the other two islands, though at the south-west corner of Little Coco what has been a creek of considerable extent is now converted into a large lagoon by a broad bank of sand having been blown and beaten up by the south-west monsoon into a firm embankment across its former outlet.

On the ridges the trees are much the same, as to species, as on the lower ground, except that the *Miliusa* which is common below is scarce

there, and the *Gyrocarpus* is rather uncommon. The *Mimusops* too, is not so abundant on the drier ground. The *Pandanus*, however, especially on the western side of the islands, ascends to the tops of the ridges and along with the *Capparis sepia* occurs *Capparis oxyphylla* (*C. tenera*, var.), the other common creepers being *Lygodium flexuosum*, *Abrus precatorius*, *Mezoneuron enneaphyllum*, *Mucuna pruriens*, *Thunbergia laurifolia*, *Dioscorea* (two species), *Calamus* (two species) exceedingly abundant and making an almost impassable cane-brake especially on the crests of the ridges; *Pæderia foetida* is another common creeper, as also is *Modecca cordifolia*. The jungle with which these are associated contains, besides the shrubs met with on the lower ground, thickets of *Cyclostemon assamicus* and other Euphorbiaceous shrubs, *Alsodeia bengalensis*, *Glyptopetalum calocarpum*, *Grewia* (two species), *Diplospora singularis*, *Ficus* (several species), etc. On one hill, in Great Coco, there is a limited patch of bamboo-jungle, the species being a *Dendrocalamus*, probably a variety of *D. Strictus*. This species also occurs on Table Island, where flowering specimens were obtained, and at first there seemed to be room for doubt as to whether it might not have been introduced on the lighthouse-island, though certainly it only occurs there in the untouched jungle and no examples exist in the clearing. The presence of the same species, however, in quantity, in the interior of Great Coco, on a hill which it is hardly extravagant to suppose had not been before ascended by any one, may be held to dispose finally of the doubt. Among the features of the jungle on exposed sea-slopes that are not grass-clad must be noted the presence in quantity, besides the other creepers found on the ridges, of *Ipomœa palmata*, *Ipomœa grandiflora* and *Convolvulus parviflorus*, the latter a particularly characteristic species on the west coast. The herbaceous undergrowth consists of *Oplismenus compositus*, *Cyperus elegans*, and a few other sedges and grasses in local patches or as stray examples; in places also occur patches of *Alocasia fornicata*, *Calanthe* sp. (apparently *C. veratrifolia*), *Dracœna spicata*, *Desmodium laxiflorum*; in one place nearly in the centre of the island, some plants of *Urena lobata* (this species does not occur in the clearings of either island and cannot here be looked upon as a weed introduced by human agency); in the drier parts considerable quantities of *Acrostichum appendiculatum*; along the sides of dry torrents a good deal of *Adiantum lunulatum*; and in one or two damp, flat spots *Ceratopteris thalictroides*.

On Table Island the west side has been artificially cleared and it is impossible to say that it ever has been jungle-covered, but several of the headlands on the west side of the Great Coco, as has already been mentioned, have naturally bare grassy slopes. There are none of these,

however, on the Little Coco. The principal grass on these slopes, and throughout the two clearings as well, is the very uninviting *Andropogon contortus*, mixed with a small amount of *Ischæmum ciliare*; besides these there is some *Cyperus polystachyus*, and in the clearings of both islands *Eleusine indica* in tufts, with here and there a little *Panicum colonum*. In Table Island, though not in Great Coco, *Eleusine ægyptiaca* and *Panicum Helopus* have also become established. In this connection it should be mentioned that *Thuarea sarmentosa*, which is the common sward-grass under the coco-nut trees of Great Coco, is very rare in Little Coco; the only spot where the coco-nut zone is there of any width has *Ischæmum muticum* growing throughout it in abundance; in Great Coco *Ischæmum muticum* is rare.

On the low ground the epiphytes in the taller trees are two species of *Hoya*, *Scindapsus officinalis*, *Dendrobium secundum* (the only common light-loving orchid, which is particularly common on trees of *Heritiera littoralis*, etc., about the mouths of creeks), *Davallia solida*, *Polypodium (Niphobolus) adnascens*, and *Polypodium quercifolium*. There is a great absence of epiphytes from the trees growing in the interior, the ferns mentioned are in particular confined to the trees nearest the sea. In the muddy ground behind mangrove-swamps there are on the stems of *Cynometra* and other trees, great numbers of an orchid that proves, on having been flowered in the Calcutta garden, to be a *Dorites* with violet flowers; apparently, however, it is only a variety of *D. Wightii*.

Perhaps a better idea of the vegetation of the islands may be obtained if extracts from the writer's notes, enumerating the species met with in particular localities, be given. Of these only a few are selected, illustrative, as far as possible, of different kinds of soil and of diverse situations. From these it will be seen that any attempt to divide the forest into distinct zones and regions is attended with difficulty, since the various forests—*Mangrove*, *Beach*, *Mud-flat*, and *Dry-ridge* jungles—merge into each other on every hand.

In crossing the island on the drier level ground near the south end of the island one finds after the belt of coco-nuts, which is there about 100 yards wide on the western side, a jungle at first not very dense of *Canarium commune*; *Aglaia andamanica*; *Millettia* sp.; *Gyrocarpus Jacquinii*, very common; *Mimusops littoralis*, the most common tree, with often great masses of *Hoya*, and near the sea with *Polypodium quercifolium* as epiphytes—all the *Mimusops* here is uniformly dying back in the topmost branches; *Bombax* sp., looking much more like *B. malabaricum* as to leaves than like the Andaman species identified by Kurz with *B. insigne*; *Dracontomelum sylvestre*; *Spondias mangifera*; *Semecarpus heterophylla*; *Albizia procera*; *Dipterocarpus* sp.; *Sterculia alata*; *Erio-*

dendron anfractuosum, etc. Under the *Cocos nucifera* on the sandy soil a sward of *Thuarea sarmentosa* with patches of *Ipomœa biloba* and with a quantity of *Eranthemum succifolium*; further inland there is a dense undergrowth of *Glycosmis pentaphylla*; *Ardisia humilis*; *Ficus brevicuspis* and *Ficus Dæmonum*; *Alsodeia bengalensis*; *Glyptopetalum calocarpum*; *Cyclostemon assamicus*; etc.—covered with a mass of *Pisonia aculeata*; *Cæsalpinia Nuga*; *Capparis sepiaria*; *Mucuna gigantea*, less common here than on muddy soil; *Calamus* sp., not very common; *Sarcostigma edule*; *Antitaxis calocarpa*; *Derris scandens*; *Thunbergia laurifolia*; *Dioscorea*, two sp.; *Vitis pedata*, very common; *Acacia rubricaulis*, often. Of sub-herbaceous plants may be mentioned *Dracaena spicata*, it is, however, less common on level ground than on the ridges. Further on were met with *Cynometra ramiflora*, with occasionally *Dorites Wightii* epiphytal, but less commonly so than where the soil is moist and muddy; considerable quantities of *Leea sambucina*; *Sterculia villosa*, as a small tree; *Stephegyne diversifolia*, though rarely; *Artocarpus Gomeziana*; *Terminalia bialata*; some *Siphonodon celastrineus*; *Oroxylum indicum*; and, as the opposite side of the island is approached, *Croton sublyratus*; *Hernandia pellata*; *Sterculia rubiginosa*; *Terminalia Catappa*; *Erythrina indica*; and the *Pandanus* sea-fence. Just before reaching this coast-zone a single example of a stemless palm (*Livistona* sp.?) was met with; another example of this was obtained on the hill where the 1889 encampment was made at the north-east corner of the island. In cutting a path across the island at another point a level sandy tract was reached on which for several hundred yards grew nothing except young *Gyrocarpus Jacquinii*.

Crossing at a point where a ridge had to be passed it was found that much of the flat land behind the coco-nut zone was taken up with a jungle of *Gyrocarpus Jacquinii*, *Macaranga Tanarius* and *Mallotus andamanicus* to the exclusion of other species; but even as far as the base of the ridge many fruits of *Cocos nucifera* that had been floated inland during the rainy season, when the whole of this level tract is evidently water-covered, are germinating freely and some coco-nut trees that have reached the light have begun to bear. On the ridge itself a dense jungle prevails, much matted, especially along the crest, with creepers; the chief of these is *Thunbergia laurifolia*, the others being *Dioscorea* sp.; *Capparis sepiaria* and *Capparis tenera*; *Derris uliginosa*; *Anodendron paniculatum*; *Abrus precatorius* and *A. pulchellus*; *Calamus*; *Pædiria fœtida*; *Modecca*; *Trichosanthes palmata*; *Porana spectabilis*; a little further along this ridge the west side and the flat land at its base was found to be a dense thicket of *Caryota sobolifera*; the herbaceous undergrowth was remarkably sparse and consisted of a few plants of *Zingiber* sp.; some patches of *Alocasia*, and a few patches of *Oplis-*

menus. The eastern side of this ridge had no flat land between it and the sea and was rather more open, the tall trees and creepers were much as on the west side, with the addition of *Argyreia tiliæfolia* and *A. Hookeri*; large masses of *Erycibe paniculata*, which is here always a heavy climber and not shrubby; and among the undergrowth with the addition of *Claoxylon* sp.; *Corypha* sp.; and near the shore *Blachia andamanica*; *Pluchea indica*; *Onesmone javanica*. On bare isolated rocks lying well out on the reefs, and never covered completely by the tide, the species found are always *Fimbristylis* sp.; *Cyperus pennatus*; and *Bærrhaavia repens*. The same species also occur on bare rocky patches of the coast all round the island but especially on the west coast. Other species associated with these in such situations are *Desmodium polycarpum*; *D. triquetrum*; *Blumea virens*; *Vernonia divergens*; *V. cinerea*; *Pluchea indica*, etc.

The isthmus uniting the outlying peninsula at the north-east corner with the main island has, mixed with the coco-nut trees occurring there, a sparse forest of *Mimusops* and *Dipterocarpus*, with an undergrowth towards the north coast almost exclusively of *Macaranga Tanarius*, towards the south almost entirely of *Dodonæa viscosa*, though here and there on hummocks of soil as opposed to sand, are other trees, like *Oroxylum indicum*; *Heterophragma adenophyllum*, etc. Among the herbaceous species here the most noteworthy is *Anisomeles ovata*, the only *Labiata* on the islands, which is, however, at this particular spot, very plentiful. On the coast of the north-east peninsula *Physalis minima* is a common species, it occurs, however, in similar situations here and there on both the Great and the Little Coco; on the slope above *Strobilanthes phyllostachyus* is gregarious and plentiful, as it likewise is at the north end of Little Coco in a similar situation.

As an example of the vegetation of level ground, where the soil is shingle instead of sand, the north end of Jerry island may be described. Here on the beach is a dense thicket of *Pemphis acidula*; behind this, a few examples of *Pandanus odoratissimus*; many *Scaevola Kœnigii*; some *Tournefortia argentea* and *Sophora tomentosa* bushes; many coco-nut trees; much *Cesalpinia Bonducella*. Behind this sea-fence the shingle is covered with a mass of *Ipomœa biloba*, a striking contrast to what occurs at the north-east corner of the island where the shingle has *I. denticulata* only. The trees on this shingle are *Terminalia Catappa*, *Cocos nucifera*, *Ardisia humilis*, *Ixora brunnescens*, *Guetarda speciosa*, *Macaranga Tanarius*, *Mimusops littoralis*, *Gyrocarpus Jacquini*, *Hernandia peltata*. Besides the *Ipomœa* the only herbaceous vegetation consisted of a few fruiting *Amorphophalli*; the tubers of these brought to Calcutta have since sent up bulbiferous leaves that shew the species to be nearly

related to, but probably quite distinguishable from, *A. bulbifer* and *A. tuberculiger*, the two species hitherto known which exhibit this character. The east side of this island has *outside* the *Pandanus* fence, which is there about three times as broad and thick as on the west, a belt of *Thespesia populnea* and *Guettarda speciosa*, with patches of *Pemphis acidula* and *Clerodendron inerme*, and some trees of *Cordia subcordata* and *Champereia Griffithiana* as well as a few thickets of *Vitex Negundo* and *Desmodium umbellatum*.

The sandy isolated spit on the reef between Great Coco and Jerry Island is not covered even by spring-tides—it is about 70 feet long from north to south by some 30 feet across, and at the time of the writer's visit there could be counted on it (mostly near the east side, and towards the south end) about a dozen germinating coco-nuts; three seedling *Hibiscus tiliaceus*, a seedling *Thespesia*, some seedlings of *Gyrocarpus*, four seedling *Mucuna*, two seedling *Erythrina*, six seedling *Carapa moluccensis*, one seedling *Barringtonia speciosa*, one seedling *Entada scandens*, some young *Ipomæa biloba*, and one young *Cynometra*, with two or three other species not recognised.

In general features Little Coco so greatly resembles the other islands that it is unnecessary to deal with it in detail. The chief feature is perhaps the great abundance of *Corypha elata* and *Siphonodon celastrineus*; still both species were met with, though sparingly, on the Great Coco.

Before concluding, however, this general account of the vegetation of the islands the two fresh water accumulations deserve to be more particularly noted. That on the Great Coco consists of a small lake in the narrow neck of land that joins the outlying north-eastern peninsula to the rest of the island. This lakelet is about 300 yards long and hardly 100 yards wide, with its longer diameter *across* the isthmus. Its depth is a little over 3 feet; it is uniformly deep from side to side and from end to end, with a hard, even bottom. At either end it is only separated from the sea by some 80 to 100 yards of shingle bank, and it seems difficult to understand why the water it contains does not ooze out, and how it is that it is unaffected by the adjacent salt water, since the bottom of the lake is lower than the point reached by the waves that beat up on the single beach, if not actually lower than the level of the highest tides. The bottom seems to be no more than the floor of what has formerly been a shallow bay on the fringing-reef, and the shingle banks which separate it at either end from the sea seem to be nothing more than the ultimate embankments that would result when the causeways connecting outlying islets with the main island are so enlarged by accretion as to cease to be covered by the tides. This postulates that the present out-

lying north-eastern peninsula had originally been detached from the main island and, being an islet of considerable width, that a causeway, ultimately becoming an embankment, has been thrown up by wave-action from each of the two adjacent bays. Soil washed down from the adjacent slopes during the rainy season has in the form of fine silt closed up the porous shingle banks at either end till these can now retain the fresh water within them and prevent the percolation of sea-water from without. To the east side of this lake there is a small flat meadow covered with *Kyllinga* and *Fimbristylis* along with some *Cyperus polystachyus* but very little grass. Whether this meadow was originally a naturally bare patch or is only part of the clearing made in connection with the abandoned settlement on the adjacent hill it is difficult to say. If, however, it was artificially cleared, it is unlike the rest of the clearing in this, that no woody jungle is reappearing in it now. At the time of our visit a number of snipe frequented the meadow. Close to the edge of the lake is a continuous belt of *Hygrophila quadrivalvis*; within this, and extending into the water, is a belt of *Polygonum* all round the margin of the lake; inside the *Polygonum* float large matted patches of *Panicum Myurus*. Here and there are patches *Limnanthemum indicum*; there is also a considerable quantity of *Nymphaea rubra*. The ordinary white *Nymphaea Lotus*, so common in similar spots in the Andamans, is not present, a circumstance which inclines one to think that this red water-lily may have possibly been introduced during the attempt to settle in the island. The water is quite potable and apparently wholesome; neither *Chara* nor *Zanichellia* is present, perhaps the water is rather deep for these.

Very different in many respects is the lagoon on Little Coco which is simply a mangrove creek that has been banked off from the sea by a small sand-dune having been thrown up across its mouth. It is not more than $1\frac{1}{2}$ –2 feet deep anywhere, with also a level but at the same time a softer bottom than the Great Coco lake, and this bottom is covered uniformly throughout by a meadow of *Chara* mixed with *Zanichellia*. Here the water, though perhaps potable on an emergency, and though used by native craft that call in for it, is slightly brackish, and the lake is fringed throughout by *Bruguiera*, *Lumnitzera*, *Ceriops*, *Avicennia*, etc., while clumps of similar mangrove trees occur throughout it. Its area is considerably greater than that of the Great Coco lake, for it is about a quarter of a mile long and a furlong across at the widest part; it was haunted at the time of our visit by teal. Here, curiously enough, *Panicum Myurus* does not occur, its place being taken by *Paspalum scrobiculatum* which floats in great patches at its south-western corner. There is no *Limnanthemum* and the *Nymphaea*

present is, as in the Andamans in such situations, the common *N. Lotus* and not, as in the Great Coco, the red-flowered variety. On the banks and extending into the water are considerable beds of *Scirpus subulatus* which does not occur in the other lake. Here on the other hand there is neither *Polygonum* nor *Hygrophila* present.

Beyond the coco-nuts the vegetable products of the island can hardly be very highly assessed. *Mimusops littoralis* (Andamanese Bullet-wood) is common and so is *Lagerstræmia hypoleuca* (Andamanese Pyen-ma); *Pterocarpus indicus* (Padouk) is rare however; and even of second- or third-rate timber trees such as *Diospyros Kurzii* (Zebra-wood); *Dipterocarpus* sp. (Wood-oil trees); *Heritiera* (Sundri); there is no great quantity; the only bamboo found (*Dendrocalamus strictus* var. ?) is not very valuable and is not abundant; while the only abundant natural grass (*Andropogon contortus*) is so uninviting that the cattle on the island prefer eating *Pandanus* leaves to grazing it.

In the subjoined list of the species obtained during the two visits (which must not, however, be considered complete, though it may safely be assumed to be representative of the vegetation of the islands), it will be seen that a number of species are undetermined. As a matter of fact they are probably mostly species hitherto undescribed, but owing to the shortness of time at the writer's disposal, and owing to both the visits being at the same season of the year, it was impossible to obtain complete material of these, and it has therefore been impossible to prepare for them specific descriptions. In some cases roots or seeds of these have been brought to Calcutta and are now in cultivation there, so that their identification will, it is hoped, only be a matter of time.

In presenting this list the writer wishes to acknowledge much kind assistance received by him in its preparation; as regards *Phanerogams*, from his friends Mr. W. B. Hemsley, F. R. S., who has kindly compared a number of the more critical specimens at Kew; Mr. J. F. Duthie, F. L. S., who kindly assisted him in naming the grasses, and Mr. J. S. Gamble, F. L. S., who examined the solitary bamboo; and as regards *Cryptogams*, from Dr. G. King, F. R. S., who kindly assisted him in determining the *Ferns*; Mr. G. Massee, F. L. S., who, through the good offices of Mr. Hemsley, kindly named the *Fungi* and supplied the description of a new species of *Xylaria*; and Mr. G. R. Milne Murray, F. L. S., who, through the intervention of Dr. King, most kindly examined the *Algæ*.

The list is followed by an analysis indicating its systematic, its physical, and its phytogeographic nature.

§ § LIST OF PLANTS COLLECTED IN THE GREAT COCO, LITTLE COCO AND
TABLE ISLAND.

PHANEROGAMÆ.

THALAMIFLORE.

ANONACEÆ.

1. *MILIUZA* sp.

Great Coco; Little Coco; very common in both islands.

The specimens obtained are in fruit only; the leaves are glabrous but otherwise are much like those of *M. Roxburghiana*; the fruits are very like those of *M. macrocarpa*.

MENISPERMACEÆ.

2. *CYCLEA PELTATA* H. f. and T.

Great Coco; common.

Burma, Nicobars. Not previously recorded from the Andaman group.

3. *ANTITAXIS CALOCARPA* Kurz.

Great Coco; common.

Andamans, Nicobars.

NYMPHÆACEÆ.

4. *NYMPHÆA LOTUS* Linn.

Great Coco; plentiful in the small lake at the north-east corner of the island—only the red flowered form (*N. rubra* Roxb.). Little Coco; sparingly in the lake at the south-west corner of the island—only the white form (*N. Lotus* Linn.).

This species is not included in any Andamans list and Kurz (*Report on the Vegetation of the Andamans*, p. 15) comments on the absence of *NYMPHÆACEÆ*. As a matter of fact this species does occur in the Andamans; as does *Barclaya longifolia*. *Nymphæa Lotus* is very plentiful everywhere about the settlement at Port Blair, and in one arm of a creek that had been shut off from the tide by a bank of earth only three months before, the writer in December 1890 found hundreds of seedling plants already springing up. The lake in which it occurs on Little Coco is only a mangrove creek naturally closed from the sea by a sand-bank and the water is still slightly brackish; the vegetation around consists of *Bruguiera*, *Lumnitzera*, *Ceriops*, *Avicennia*, and other mangrove swamp species.

CAPPARIDEÆ.

5. *CAPPARIS SEPIARIA* Linn. *var. GRANDIFOLIA* Kurz Mss. ex Prain, Jour. As. Soc., Beng., lix, Pt. 2, p. 275.
Table Island; Great Coco; Little Coco. Very common everywhere in the group, both on ridges and flat land.
Diamond Island (Arracan); Andamans; Java; Bali; Madura.
6. *CAPPARIS TENERA* Dalz. *var. LATIFOLIA* H. f. and T. (*C. oxyphylla* Wall.)
Table Island; Great Coco; Little Coco. Very common everywhere in the group, but only on ridges.
Tenasserim; Andamans (Middle Island and South Island).

VIOLACEÆ.

7. *ALSODEIA BENGALENSIS* Wall.
Table Island; Great Coco; Little Coco. One of the commonest undershrubs in the group.
Silhet, rare; Martaban, frequent; Andamans, very common everywhere; Nicobars, very rare.

GUTTIFERÆ.

8. *GARCINIA* ? sp.
Great Coco.
An altogether doubtful plant represented by one leaf specimen among the plants collected by Mr. Kurz in 1866; nothing resembling it was met with in 1889 or 1890. Mr. Kurz did not himself collect in Great Coco. A deputation that visited the island while he was at Port Blair brought him a few specimens; there may even be some confusion as to the locality—the deputation visited Narcondam and elsewhere as well as the Cocos.
9. *CALOPHYLLUM INOPHYLLUM* Linn.
Little Coco. In beach-forests on shingle behind the sea-face vegetation, not common.
Shores of India, Andamans, Nicobars, Burma, Malaya, Polynesia, Australia, and E. African islands.

DIPTEROCARPEÆ.

10. *DIPTEROCARPUS PILOSUS* Roxb. ?
Great Coco; eastern coast, inland from Ford Bay, common. Only leaf specimens obtained and it is not impossible that they may belong to *D. Griffithii*, Miq.

11. *DIPTEROCARPUS ALATUS* Roxb.

Great Coco ; common. Little Coco ; infrequent.

Chittagong, Burma, Tenasserim, Andamans.

MALVACEÆ.

12. *SIDA ACUTA* Burm.

Table Island ; cleared hillsides near lighthouse.

A cosmopolitan tropical weed.

13. *URENA LOBATA* Linn.

Great Coco ; in one spot only, in interior of island.

A cosmopolitan tropical weed, introduction in this case may be attributed to bird agency. It hardly seemed to be indigenous as there were where it was gathered only a few plants. Yet human agency appears impossible : the species is not present at the north-east of Great Coco where once a small clearing was made, nor on Table Island where there is now a large clearing. It does not seem to be present in the Little Coco.

Cosmopolitan in the tropics.

14. *HIBISCUS SABDARIFFA* Linn.

Great Coco only ; as if spontaneous in the small clearing ; one of the few remains of a garden that existed during the short time an attempt was made to settle in the island ; the few plants seemed unhealthy.

Cultivated in the tropics.

15. *HIBISCUS ABELMOSCHUS* Linn.

Table Island only ; common throughout the clearing, escaped from cultivation.

Cosmopolitan in the tropics.

16. *HIBISCUS TILIACEUS* Linn.

Table Island ; Great Coco ; Little Coco ; common, especially on the western coast, also plentiful at times in muddy flats behind mangrove swamps. A stunted almost glabrous form occurs on coral-shingle on Jerry Island.

Littoral species, cosmopolitan in the tropics.

17. *THESPESIA POPULNEA* Corr.

Very common on all the islands.

Littoral species on all tropical coasts in eastern hemisphere, introduced into West Indies.

18. *BOMBAX INSIGNE* Wall. ? *vars.*—??There are two forms of *Bombax* present in the islands :—

1. A tree with armed trunk and branches ; *leaflets* about 6, entire, narrowly lanceolate 5–8 inches long, 1–1½ inches wide, gradually tapering to both ends almost sessile, *stamens* numerous. This is com-

mon in all the islands, and if the writer is correct in considering the character of armed or unarmed trunk a trivial one, is the common *Bombax* in S. Andaman. The leaves suit exactly, and though in S. Andaman the trunk of old tall trees is smooth, young saplings are armed, as are the ultimate branchlets even of old trees. The leaves are unlike any of the Indian or Burmese gatherings either of *Bombax malabaricum* or of *Bombax insigne*.

2. A tree with unarmed trunk and branches, *leaflets* about 6, entire, obovate, acuminate 9–11 inches long, $2\frac{1}{2}$ –3 inches wide, gradually tapering into petiolules $\frac{1}{2}$ – $\frac{3}{4}$ inches long, *stamens* numerous. This was obtained only in Little Coco, it occurs in South Andaman also, for there are specimens at Calcutta, obtained by Mr. Kurz at Port Monat on the west coast. It does not at all resemble as to leaves of the other form nor does it resemble the leaves of Wallich's type specimen of *B. insigne*. But its leaves precisely resemble those of *Wall. Cat.* 1840/4 (from Taong DOUNG, Burma), which was issued as *B. malabaricum* var. *albiflorum*, Wall. The number of stamens makes it impossible to refer the Andaman plant at least to *B. malabaricum*.

In South Andaman both forms have the leaves *glaucous* beneath; in the Cocos neither form has; so that this character perhaps cannot be held as valid. Mr. Kurz did not consider the two Andamans forms separable from each other, and in one place he referred them to *B. malabaricum*, but afterwards, on account of the staminal character, united them to *B. insigne*. He has, however, left a manuscript name "*B. heterophyllum*," which proves both that he had noted the existence of the two kinds of foliage and that he could not separate the plants exhibiting them from each other.

It should be noted that the convicts and others at Port Blair distinguish two kinds of "Semul" or "Cotton-tree." The distinction does not, however, apply to the two forms referred to above, but to these two taken together and to the following species.

Both islands.

South Andaman. Burma?

19. *ERIODENDRON ANFRACTUOSUM* DC.

Both islands, common.

India, Burma, Malaya, Africa, and America.

STERCULIACEÆ.

20. *STERCULIA VILLOSA* Roxb.

Great Coco; Little Coco

India.

21. *STERCULIA RUBIGINOSA* Vent. *var. GLABRESCENS* King.
Great Coco.
A variety restricted to the Andamans and Nicobars.
22. *STERCULIA PARVIFLORA* Roxb.
Little Coco ; only leaf specimens which, however, agree with some from Penang.
23. *STERCULIA ALATA* Roxb.
Both islands, frequent.
India, Burma, Malaya.
24. *STERCULIA COLORATA* Roxb.
Great Coco.
India, Burma, Malay Archipelago.
25. *STERCULIA CAMPANULATA* Wall.
Little Coco.
Burma, Andamans, Java.
26. *HERITIERA LITTORALIS* Dryand.
Great Coco ; Little Coco ; common in the creeks.
Littoral species on tropical coasts of eastern hemisphere.
27. *BUETTNERIA ANDAMANENSIS* Kurz.
Little Coco ; common.
Andamans, Tenasserim.

TILIACEÆ.

28. *BERRYA AMMONILLA* Roxb.
Little Coco, frequent.
India, Ceylon, Burma, Andamans.
29. *GREWIA LEVIGATA* Vahl.
In all the islands, common.
India, Burma, Malaya, Australia, Africa.
30. *GREWIA CALOPHYLLA* Kurz.
Little Coco, common.
Andamans.
31. *GREWIA MICROCOS* Linn.
Great Coco, infrequent.
India, Burma, China, Malaya.

DISCIFLOREÆ.

RUTACEÆ.

32. *GLYCOSMIS PENTAPHYLLA* Corr.
In all the Islands ; both the arboreous and the shrubby form extremely common.
Throughout India, Indo-China, and Malaya.

BURSERACEÆ.

33. *GARUGA PINNATA* Roxb.
Great Coco; common.
India, Burma, Malaya.
34. *CANARIUM EUPHYLLUM* Kurz.
Great Coco; very common.
Andamans.

MELIACEÆ.

35. *AGLAIA ANDAMANICA* Hiern.
Great Coco, Little Coco; common. Flowers sweet-smelling.
Andamans.
36. *AMOORA ROHITUKA* W. & A.
Great Coco; common.
India, Burma, Malaya.
37. *CARAPA MOLUCCENSIS* Lamk.
Great Coco; rather uncommon. The form with obtuse leaves (*C. obovata* Bl.) only occasional in the creeks, but very frequent germinating along the beaches of all the islands. The form with ovate cordate acuminate leaves in two or three places on rocky parts of the eastern coast. Little Coco; in one place only (form = *C. obovata* Bl.)
38. *CHICKRASSIA TABULARIS* A. Juss. ?
Great Coco; common. In leaf only, but evidently identical with the tree identified with this species by Mr. Kurz in *Reg. Veg. Andam.*, p. 33.

OLACINEÆ.

39. *CANSIERA RHEEDII* Gmel.
Great Coco; a common climber.
India, Burma, Malaya, N. Australia, S. China.
40. *PHLEBOCALYMNA LOBBIANA* Mast.
Little Coco.
Tenasserim and Martaban.
41. *SARCOSTIGMA WALLICHII* Baill. (*S. edule* Kurz.)
Great Coco; rather common.
Andamans. Mr. Kurz has in the Calcutta herbarium suggested the reduction of his own species to *S. Wallichii* Baill., a plant from the Salween valley, nor is there any character by which the two can be distinguished.

CELASTRINEÆ.

42. *GLYPTOPETALUM CALOCARPUM* Prain, Jour. As. Soc. Beng., lx, 2, 209
—*Euonymus calocarpus* Kurz.

Common in all the islands, also reported from Narcondam (leaf specimens only, and the locality perhaps a mistake—the writer could not find the shrub in Narcondam). Very nearly related to *G. zeylanicum* Thwaites, from Ceylon and S. India, but easily distinguished by its shorter racemes, smaller flowers and hardly foveolate petals. The fruits and seeds are exactly as in *G. zeylanicum*. In this the leaves are always entire.

43. *SALACIA PRINOIDES* DC.

Great Coco ; in creeks, an extensive climbing shrub, associated with *Avicennia officinalis*.

India, Burma, Malaya, Philippines.

44. *SIPHONODON CELASTRINEUS* Griff.

Great Coco, occasional ; Little Coco, very common. A considerable tree.

Pegu, Penang, Java.

RHAMNEÆ.

45. *VENTILAGO CALYCVLATA* Tulasne.

Great Coco.

India, Burma, Malaya.

46. *ZIZYPHUS CENOPLIA* Mill.

Great Coco, not at all common.

India, Burma, Malaya, N. Australia.

47. *COLUBRINA ASIATICA* Brogn.

Little Coco ; coast at north end of island.

India, Ceylon ; Burma, Malaya ; N. Australia ; S. W. Africa.

AMPELIDÆ.

48. *VITIS PENTAGONA* Roxb.

Table Island and Great Coco ; common.

Chittagong, Arracan, Andamans.

49. *VITIS CARNOSA* Wall.

Common on all the islands.

India, Burma, Malaya.

50. *VITIS PEDATA* Wall.

Great Coco, and Little Coco ; very common.

India, Burma, Malaya.

51. *LEEA SAMBUCINA* Willd.

Interior of all the islands, common.

India, Burma, Malaya.

52. *LEEA HIRTA* Roxb.

Great Coco.

India, Burma, Malaya.

SAPINDACEÆ.

53. *ERIOGLOSSUM EDULE* Blume.
Both islands, on ridges, common.
India, Burma, Malaya, North Australia.
54. *ALLOPHYLUS COBBE* Blume.
Great and Little Coco ; not uncommon along the western sea-face.
India, Burma, Malaya.
55. *SAPINDUS DANURA* Voigt.
Great Coco.
Assam, Burma.
56. *POMETIA TOMENTOSA* Kurz.
Great Coco, common.
Indo-China, Andamans, Nicobars, Malaya, Ceylon.
57. *DODONÆA VISCOSA* Linn.
Great Coco ; a small tree very common at the north-east corner of the island.
Cosmopolitan in the tropics.

ANACARDIACEÆ.

58. *ODINA WODIER* Roxb.
Great Coco.
India, Ceylon ; Burma, Tenasserim.
59. *PARISHIA INSIGNIS* Hook. f.
Great Coco ; in leaf only.
Tenasserim, Andamans.
60. *SEMECARPUS SUBPANDURIFORMIS* Wall.
Great Coco only, but there rather frequent near the eastern coast.
Chittagong ; *Gamble*. Arracan, in the Kolodyne valley, *Kurz* ; on Boronga Island, *Kurz*. Originally this was known only from specimens grown in the Calcutta garden (introduced from Chittagong) distributed by Dr. Wallich (*Cat.* n. 987).
61. *SEMECARPUS HETEROPHYLLUS* Blume.
Great Coco, interior, rather frequent ; Little Coco, interior, extremely common.
Pegu, Tenasserim ; Andamans, Nicobars ; Sumatra, Java.
62. *SPONDIAS MANGIFERA* Willd.
Great Coco and Little Coco, very common in the interior of both islands ; the fruits are yellow and extremely sour, but much eaten by the wild pigs (*Sus andamanensis*) which abound.
Tropical Asia ; Mr. Kurz found this in S. Andaman also.
63. *DRACONTOMELUM MANGIFERUM* Blume.
Great and Little Coco, frequent : in leaf only.

Andamans, Nicobars; Malay Peninsula and Archipelago; Philippines and Fiji Islands.

MORINGEÆ.

64. *MORINGA PTERYGOSPERMA* Gaertn.

Great Coco; a few trees have been planted at the north-east corner of the island by the people of the attempted settlement; a large number of seedlings have already appeared though the introduction has been so recent.

India; indig. in North-West Himalaya, elsewhere cultivated in tropical countries.

CALYCIFLOREÆ.

CONNARACEÆ.

65. *CONNARUS GIBBOSUS* Wall.

Great Coco.

Tenasserim, Malaya; Andamans.

LEGUMINOSÆ.

66. *CROTALARIA SERICEA* Retz.

Table Island; very common throughout the clearing; apparently introduced, as it was not found in Great Coco or Little Coco. This species does not seem to occur in the Andaman group proper; at Port Blair in S. Andaman *Crotalaria retusa* is the species that has been introduced and occupies similar localities.

India, Burma, Malaya.

67. *DESMODIUM UMBELLATUM* DC.

In all the islands, very common on the coast.

India, Burma, Andamans, Malaya, Philippines, Polynesia, Mascarene islands.

68. *DESMODIUM TRIQUETRUM* DC.

Table Island and Great Coco; very common on bare rocky slopes on west coast, occasional on higher ground in the interior; Little Coco, occasional in the interior.

India, Burma, Malaya, Andamans; Philippines; S. China.

69. *DESMODIUM LAXIFLORUM* DC.

In all the islands, rather frequent on the higher ground in the interior.

India, Burma; Andamans, Nicobars; Malaya.

70. *DESMODIUM POLYCARPUM* DC.

Table Island and Great Coco; very abundant on all the rocky slopes

on the western coasts. This species has been referred to (*Jour. As. Soc., Beng.*, lix, pt. 2, p. 251) as perhaps introduced into the Andamans, because Mr. Kurz did not meet with it in 1866 when he explored a part of the group. But from what the writer has been able to note since, he is convinced that the species is indigenous in the Andaman group.

East Africa; Tropical Asia; Malaya, Philippines; China, Japan; Polynesia.

71. *DESMODIUM TRIFLORUM* DC.

Table Island, in the lighthouse clearing on grassy slopes. There is a white- and a red-flowered variety and both are equally common.

Cosmopolitan in the tropics.

72. *ALYSICARPUS VAGINALIS* DC.

Great Coco, in the small clearing at the north-east corner of the island, probably introduced.

Tropical weed indigenous in eastern hemisphere; introduced in America.

73. *PHASEOLUS* sp.

Great Coco. Appearing as seedlings in the droppings of the half-wild cattle on a bare grassy hill-side in the south-west of the island, much frequented by these, were seen during the second visit to the island numerous examples of what appears to be a species of this genus. Each leaflet has in the centre a reniform white mark which ought to be distinctive, yet the writer cannot recall a variety which exhibits this. The origin of the seeds could not be traced, no *Phaseolus* was observed in the abandoned clearing in 1889, and unfortunately it was impossible to re-examine that locality in 1890.

74. *ABRUS PRECATORIUS* Linn.

Great Coco, common; Little Coco, very common.

Cosmopolitan in the tropics.

75. *ABRUS PULCHELLUS* Wall.

In all the islands, very common.

Africa, India, Burma, Malaya, Andamans.

76. *ERYTHRINA INDICA* Lamk.

In all the islands, in coast zone; not nearly so common as it is on Diamond Island at the mouth of the Bassein river.

India, Burma, Malaya; Andamans, Nicobars.

77. *MUCUNA GIGANTEA* DC.

Great and Little Coco; one of the commonest climbers on flat land in the interior behind the mangrove swamps.

India, Andamans; Malaya; Philippines; Polynesia.

78. *MUCUNA PRURIENS* DC.

Table Island, very common, interior jungle on ridges.

Cosmopolitan in the tropics.

79. *PUERARIA CANDOLLEI* Graham.
Little Coco, common.
Pegu, Tenasserim.
80. *PUERARIA PHASEOLOIDES* Benth.
Great Coco, common on the western coast.
India, Burma, S. China, Malaya.
81. *CANAVALIA OBTUSIFOLIA* DC. (*Dolichos lineatus* Thunbg.)
In all the islands, one of the commonest climbers along the sea-face here as on the Burmese, the Andamans, Nicobars and Malay coasts.
Cosmopolitan on tropical shores.
82. *VIGNA LUTEA* A. Gray.
Little Coco, very common on coasts both east and west ; Great Coco, rather rare.
Martaban, Malaya ; Andamans, Nicobars.
Cosmopolitan in tropics, but absent from India.
83. *PTEROCARPUS INDICUS* Willd.
Great Coco, infrequent.
India, Burma, Andamans, Malaya ; Philippines ; S. China.
84. *DERRIS SCANDENS* Benth.
Great and Little Coco ; very common.
India, Burma, Andamans, Malaya ; S. China, N. Australia.
85. *DERRIS SINUATA* Benth.
Great Coco, extremely common on the eastern coast.
Pegu, Tenasserim, Malay Peninsula ; Andamans, Malay islands ; Ceylon.
86. *DERRIS ULIGINOSA* Benth.
Both islands, common, on rocky parts of the coast.
India, Burma, Malaya, Africa, Australia, Polynesia.
87. *PONGAMIA GLABRA* Vent.
In all the islands, a common tree in the coast zone and especially along the sides of mangrove creeks ; never seen climbing.
India, Burma, Andamans, Malaya ; Polynesia ; N. Australia ; Seychelles.
88. *SOPHORA TOMENTOSA* Linn.
Great and Little Coco, west coast, but infrequent.
Cosmopolitan on tropical sea-shores.
89. *MEZONEURON ENNEAPHYLLUM* W. & A.
Great Coco, common on summits of interior ridges.
Cachar, Chittagong ; Pegu, Tenasserim, Ceylon, Malay Archipelago.
90. *CÆSALPINIA BONDUCELLA* Flem.
In all the islands, very common in the sea-face jungle along the beaches.
Cosmopolitan in the tropics.

91. *CÆSALPINIA NUGA* Ait.

In all the islands; very common in the jungle on flat land behind beaches and mangrove-swamps.

India, Ceylon; Burma; Malaya; Philippines; N. Australia; S. China; Polynesia.

92. *TAMARINDUS INDICA* Linn.

Great Coco; a single large tree on west side of mouth of creek opening into Pollok Bay. This tree grows in a place where it could hardly have been planted; if planted where it grows it can hardly be imagined for what object the position was selected and the tree is obviously much older than the last attempt at settlement in the island. This bay is at certain seasons an anchorage for Burmese junks calling to obtain coco-nuts and the introduction of the tree is probably due to a tamarind fruit having been cast overboard from one of these junks and thrown up by the tide where the tree now grows.

Throughout the tropics, cultivated; perhaps indigenous in Africa.

93. *CYNOMETRA RAMIFLORA* Linn.

In all the islands; very common in flat, muddy lands behind mangrove swamps.

India, Ceylon; Burma, Andamans, Nicobars, Malaya; Philippines; N. Australia.

94. *ENTADA SCANDENS* Benth.

In all the islands, frequent; its seeds occur in all the shore-drifts and it was one of the species found germinating on a sandy spit (an incipient island) between Jerry Island and the south end of Great Coco.

Cosmopolitan in the tropics.

95. *ADENANTHERA PAVONINA* Benth.

Table Island and Great Coco, common.

India, Ceylon; Burma, Andamans, Malaya; Philippines; S. China.

96. *ACACIA CONCINNA* DC.

Great Coco, rather common.

India, Ceylon; Burma, Malaya; S. China.

97. *ACACIA PENNATA* Willd.

In all the islands, very common.

Africa; India, Ceylon; Burma, Andamans, Malaya.

98. *ALBIZZIA LEBBEK* Benth.

Great Coco.

Africa; India, Ceylon; Burma, Tenasserim, Malaya; Andamans; China; N. Australia.

99. *ALBIZZIA PROCERA* Benth.

In all the islands exceedingly common on the interior ridges; stunted and weatherbeaten where it approaches the west coast.

India, Burma, Malaya, Philippines, (not yet recorded from south Andaman).

RHIZOPHOREÆ.

100. *RHIZOPHORA MUCRONATA* Lamk.
Great and Little Coco, frequent in mangrove swamps.
Tropical shores of Africa, Asia, and N. Australia.
101. *RHIZOPHORA CONJUGATA* Linn.
Great Coco, common.
Tropical shores of Asia, and Africa.
102. *CERIOPS CANDOLLEANA* Arn.
Great Coco, common.
Tropical shores of Eastern Hemisphere.
103. *CERIOPS ROXBURGHIANA* Arn.
Great Coco, not common.
Tropical shores of Eastern Hemisphere.
104. *BRUGUIERA GYMNO RHIZA* Lamk.

In all the islands, common. This is the chief constituent of the mangrove jungle in the group; it germinates very freely also along the sandy beaches though there it doubtless does not persist; it also germinates along the ridges of coral that are formed between the mainland and small outlying islets like Lascelles Island, Rat Island, Button, and others, and as the roots spread they help to collect the "drift" of the tides and shew how it is possible for the island to increase in size without postulating a general upheaval for the group. On bare rocky promontories on the west coast where long rocky ledges and reefs of loose boulders run many yards out to sea, numbers of seedlings also appear and though these spots are exposed to the full force of the south-west monsoon many of these resist the waves for at least several seasons; the only other constituent of the mangrove jungle that does this is *Avicennia*, many specimens of which though dwarf and weatherbeaten are evidently of considerable age. *Pemphis*, which also greatly affects such positions is not partial to mangrove swamps proper at all and was never seen along the creeks. In the small lake on Little Coco the water of which was potable though not good almost all the constituents of a mangrove swamp were growing freely.

Tropical shores of Eastern Hemisphere and Polynesia.

COMBRETACEÆ.

105. *TERMINALIA CATAPPA* Linn.
In all the islands; one of the commonest trees on the shore and

not infrequent in the interior on flat lands, but not met with ascending the ridges. There is apparently no such species as *T. procera*.

Andamans, Malaya; planted elsewhere in the tropics.

106. *TERMINALIA BIALATA* Kurz.

Great Coco, frequent.

Burma, Tenasserim, Andamans.

107. *LUMNITZERA RACEMOSA* Willd.

Little Coco, very common among mangroves in the lagoon.

Tropical shores of Eastern Hemisphere and Polynesia.

108. *ILLIGERA CONYZADENTIA* Meissn.

Great Coco, a rather common climber.

Tenasserim, Andamans.

109. *GYROCARPUS JACQUINI* Roxb.

In all the islands, probably the commonest species in the group.

Tropical sea-shores of the old world and Polynesia.

MYRTACEÆ.

110. *BARRINGTONIA SPECIOSA* Forst.

In all the islands, very common.

Ceylon; Andamans, Nicobars; Malaya; Australia; Polynesia: on sea-shores.

111. *BARRINGTONIA RACEMOSA* Blume.

In all the islands, very common.

India, Ceylon; Burma, Malaya; Andamans, Nicobars; Polynesia: on sea-shores.

MELASTOMACEÆ.

112. *MEMECYLON EDULE* Roxb.

Great Coco; east coast, on rocky promontory at south end of Ford Bay—only one tree seen.

Andamans, Malaya, Philippines. Mr. Kurz has a specimen from Great Coco also, only in leaf, and has it from S. Andaman in flower.

LYTHRACEÆ.

113. *PEMPHIS ACIDULA* Forst.

In all the islands; very common, especially on the west coast on rocky or shingly promontories.

Tropical shores of Eastern Hemisphere.

114. *LAGERSTREMLIA HYPOLEUCA* Kurz.

Great Coco, common in the interior.

Andamans.

115. *LAGERSTROMIA* sp.

Little Coco ; one tree only seen.

A tall straight tree, about 100 feet, leaves sessile, oblong-lanceolate 8 in. long, $2\frac{1}{4}$ – $2\frac{3}{4}$ in. wide, thinly coriaceous, fruit $\frac{1}{2}$ in., calyx woody, lobes spreading.

The leaves of this are unlike those of any Indian species ; the fruit is very like that of *L. calyculata* Kurz, from Martaban, but the leaves are very different, being larger, much thinner, and perfectly glabrous. This, when flowers are found, will almost certainly prove a distinct species.

PASSIFLOREÆ.

116. *MODECCA CORDIFOLIA* Blume (fide Masters).

Great Coco, common.

Andamans ; the specimens are exactly like the common Andaman coast *Modecca* and the flowers appear not to differ from those of *M. cardiophylla* Mast.

117. *CARICA PAPAYA* Linn.

Great Coco, introduced but perfectly naturalised and already extending in an unbroken line among the coco-nuts on the east coast, from the north-east corner to within 3 miles of the south end of the island ; one or two isolated specimens occur at the south-east corner evidently originating from fruits washed up by the sea. Half a mile from the south end on the west coast is another spot, well into the interior, where some trees occur—the result apparently of independent introduction as they occur near the remains of some huts used by coco-nut gatherers who visit the island at intervals.

Cultivated in warm countries ; originally American.

CUCURBITACEÆ.

118. *TRICHOSANTHES PALMATA* Roxb.

Little Coco ; near north end of island.

India, Ceylon ; Burma, Andamans ; Malaya ; N. Australia ; China, Japan.

FICOIDEÆ.

119. *SESUVIUM PORTULACASTRUM* Linn.

In all the islands ; common on sandy beaches on the east coast.

All tropical and sub-tropical sea-shores.

COROLLIFLORE.

RUBIACEÆ.

120. *STEPHEGYNE DIVERSIFOLIA* Hook. f.
In all the islands, extremely common.
Chittagong, Burma, Tenasserim ; Philippines.
121. *MUSSENDA CALYCINA* Wall. (*M. macrophyllæ* forma distinctior).
In all the islands very common. The calyx-teeth in these examples are $\frac{3}{4}$ in. long and $\frac{1}{4}$ in. broad.
Pegu, Tenasserim, Andamans.
122. *WEBERA KURZII* Hook. f.
Little Coco ; common in interior.
Andamans.
123. *RANDIA LONGIFLORA* Lamk.
Little Coco, common.
Assam, Chittagong, Burma, Tenasserim, Malaya ; Andamans, Nicobars.
124. *DIPLOSPORA SINGULARIS* Korth.
In all the islands, extremely common.
Assam, Burma, Tenasserim ; Malaya. Not yet reported from other parts of the Andaman group.
125. *GUETTARDA SPECIOSA* Linn.
Great Coco, east coast ; frequent.
Cosmopolitan on tropical sea-shores.
126. *IXORA GRANDIFOLIA* Zoll. & Mor., var. *KURZEANA* Teys. & Binnend.
In all the islands, common in the interior jungle ; a small straggling shrub.
Nicobars. This is exactly like the type of Teysmann and Binnendyk's *I. Kurzeana*.
127. *IXORA BRUNNESCENS* Kurz.
In all the islands ; very common along the beaches. A fine tree, often 60–80 feet ; extremely unlike the preceding.
Andamans, Nicobars.
128. *IXORA CUNEIFOLIA* Roxb.
Little Coco ; infrequent.
Assam, Burma, Tenasserim.
129. *PAVETTA INDICA* Linn.
In all the islands, very common.
India ; Burma, Andamans ; Malaya ; S. China ; N. Australia.
130. *MORINDA CITRIFOLIA* Linn., var. *BRACTEATA* Roxb.
In all the islands, exceedingly common along the coast.
Laccadives ; Andamans ; Nicobars ; Sunderbuns ; Arracan.

131. *PSYCHOTRIA ADENOPHYLLA* Wight.
Very common in all the islands.
Assam, Pegu, Tenasserim ; Andamans.
132. *PÆDERIA FETIDA* Linn.
Very common in all the islands.
India, Burma, Malaya.

COMPOSITÆ.

133. *VERNONIA CINEREA* Less.
Table Island, common in the clearing near the lighthouse ; Great Coco, frequent in the small clearing at the north-east corner but also plentiful on bare rocks on the western sea-face of the island. Though probably an introduced plant in the two first situations, its appearance on the west coast, where it is extremely plentiful, indicates that it has also reached the island independently of human agency.
Tropical Asia, Africa and America.
134. *VERNONIA DIVERGENS* Benth.
Great Coco ; plentiful on rocky promontory at north end of island.
India, Burma, Tenasserim.
135. *ADENOSTEMMA VISCOSUM* Forst.
Great Coco, on the western coast and at the north end of the island.
Cosmopolitan in the tropics.
136. *AGERATUM CONYZOIDES* Linn.
Table Island, common in the clearing near the lighthouse.
Cosmopolitan in the tropics ; originally American.
137. *BLUMEA VIRENS* DC.
Great Coco, profuse on rocks on western sea-face ; in one sheltered cove the stems were over 8 feet high.
India, Burma, Tenasserim (Mergui, *Griffith*).
138. *PLUCHEA INDICA* Less.
Great Coco, common on the coast.
India, Burma, Malaya, China ; sea-shores.
139. *WEDELIA SCANDENS* C. B. Clarke.
In all the islands, common in the sea-fence jungle, a rather brittle woody climber with stems 30—50 feet long.
Tropical sea-shores of India, Burma, Malaya, Andamans and Nicobars.

GOODENOVIÆ.

140. *SCÆVOLA KÖNIGII* Vahl.
In all the islands, very common in the coast zone.
India, Burma, Malaya, Australia, Polynesia ; on sea-coasts.

MYRSINÆ.

141. *ARDISIA HUMILIS* Vahl.

In all the islands, common in the beach forest.

India, China, Malaya.

142. *ÆGICERAS MAJUS* Gaertn.

Great Coco; fruits seen in the sea-drifts on the coast; doubtless the species occurs frequently in the mangrove swamps, though no individual tree was met with.

. Cosmopolitan on tropical sea-coasts.

SAPOTACEÆ.

143. *MIMUSOPS LITTORALIS* Kurz.

In all the islands; next to *Gyrocarpus Jacquinii*, this (the Andaman Bullet-wood) is the commonest tree in the group.

In Jerry Island, off the south end of Great Coco, and for about two miles along the coast at the south end of Great Coco, nearly every tree that has attained a height of 80 feet presents from the sea the appearance of being dead. Closer inspection, however, shews that in many (perhaps most) cases only the whole of the main branches are dead, while about their bases or along the main trunk numerous close bunches of small branches have appeared, the leaves of which keep the trees still alive. The same thing is apparent at the south-west corner of Little Coco but is less striking because less extensive.

Andamans, Nicobars.

EBENACEÆ.

144. *DIOSPYROS KURZII* Hiern.

Little Coco; Great Coco, rare.

Andamans, Nicobars.

APOCYNÆÆ.

145. *RAUWOLFIA SERPENTINA* Benth.

Great Coco, common.

India, Burma, Tenasserim, Java; not previously reported from the Andamans.

146. *CERBERA ODOLLAM*, Gaertn.

Great Coco, rare; in mangrove swamps.

India, Malaya, Andamans; China; Australia, Polynesia.

147. *OCHROSIA BORBONICA* Gmel.

Little Coco, common; in beach forests.

Andamans, Malaya, Seychelles, Mascarene Islands.

148. *TABERNÆMONTANA CRISPA* Roxb.

In all the islands, very common along the west coast.

Andamans Nicobars, Diamond Island (off Arracan coast).

149. *STROPHANTHUS WALLICHII* A. DC.

Great Coco ; a large climber, in leaf only.

India, Assam, Chittagong.

150. *ANODENDRON PANICULATUM* A. DC.

In all the islands.

India, Burma, Malaya, Philippines.

151. *CHONEMORPHA MACROPHYLLA* G. Don.

Little Coco, common.

India, Andamans, Malaya.

ASCLEPIADEÆ.

152. *SARCOLOBUS GLOBOSUS* Wall.

Great Coco and Little Coco ; common in mangrove swamps.

Sunderbuns, Tenasserim, Malay Peninsula ; Nicobars.

153. *HOYA PARASITICA* Wall.

Great Coco.

Assam, Khasia, Chittagong, Tenasserim, Malaya ; Andamans.

154. *HOYA DIVERSIFOLIA* Blume.

In all the islands ; extremely common.

Burma, Malaya.

155. *DISCHIDIA NUMMULARIA* R. Br.

Little Coco ; not common.

Cachar, Chittagong, Tenasserim, Malaya, Andamans ; Australia.

GENTIANACEÆ.

156. *LIMNANTHEMUM INDICUM* Thwaites.

Great Coco ; abundant in the small lake at the north-east corner of the island ; not in the lake on Little Coco and not previously reported from the Andamans. The lake is adjacent to the small clearing and the species may possibly be an introduced one in this locality.

Afghanistan ; India, Burma, Malaya ; Australia, Fiji ; Mascarene islands.

BORAGINEÆ.

157. *CORDIA SUBCORDATA* Lamk.

Great Coco, a rather common tree in the beach-forests on the east coast.

Andamans, Malaya ; Australia ; Sandwich Islands.

158. *TOURNEFORTIA ARGENTEA* Linn. f.

Great Coco, very rare; Little Coco, extremely common on the western coast and in the beach-forests, where it often reaches a height of 35—40 feet with a trunk of sometimes a foot diameter.

Ceylon; Malaya, Andamans, Nicobars; Australia; Mauritius.

CONVOLVULACEÆ.

159. *ERYCIBE PANICULATA* Roxb.

Great Coco, very common in interior.

India, Burma, Tenasserim; Malaya; Andamans, Nicobars; Australia.

160. *ARGYREIA TILIÆFOLIA* Wight.

Great Coco; common on the coasts.

India; Andamans, Malaya; Philippines; near the sea.

161. *ARGYREIA HOOKERI* Clarke.

In all the islands, common.

Sikkim, Bhutan, Assam, Martaban.

162. *ARGYREIA LANCEOLATA* Choisy.

Great Coco: exactly=*Wall. Cat.* 1395.

Tenasserim, Andamans.

163. *LETTSOMIA PEGUENSIS* Clarke.

Little Coco.

Pegu, Tenasserim, Andamans.

164. *IPOMÆA GRANDIFLORA* Lamk.

In all the islands, very abundant on the coasts.

East Africa; India, Burma, Malaya, Andamans; Australia, Polynesia; introduced in America.

165. *IPOMÆA COCCINEA* Linn.

Table Island, rampant in the jungle near the lighthouse clearing; escape from the light-keeper's garden.

Native of America; cult., and a frequent escape, in tropical Asia.

166. *IPOMÆA BATATAS* Lamk.

Table Island, cultivated in the lighthouse garden.

Native of America; cult., in the tropics generally.

167. *IPOMÆA DIGITATA* Linn.

Great Coco, on the west coast, occasional.

Cosmopolitan in the tropics.

168. *IPOMÆA DENTICULATA* Choisy.

Great Coco, very plentiful at north end of island, but almost altogether restricted to the coral-shingle; at south end of island and on Little Coco, exceedingly uncommon.

Seychelles; Ceylon; Malaya, Andamans and Nicobars; Australia, Polynesia.

169. *IPOMÆA TURPETHUM* R. Br.

Both islands, not uncommon.

India, Burma; Malaya; Australia, Polynesia; Mauritius, Seychelles.

170. *IPOMÆA BILOBA* Forsk.

In all the islands, very common; affects principally the sandy beaches; in Jerry Island, however, grows on the shingle and occurs under rather dense jungle, from side to side of that island, at its north end.

Cosmopolitan on tropical sea-shores.

171. *CONVOLVULUS PARVIFLORUS* Vahl.

In all the islands; very common in the jungle along the western sea-face.

Africa; India, Burma, Malaya, Andamans; Australia.

172. *PORANA SPECTABILIS* Kurz.

Great Coco.

Tenasserim, Andamans.

SOLANACEÆ.

173. *SOLANUM MELONGENA* Linn.

Table Island, cultivated in the light-house garden; Great Coco, plentiful and quite naturalised all over the clearing at the north-east corner of the island; remains of the garden.

Cult. in all warm countries.

174. *PHYSALIS MINIMA* Linn.

Great Coco; abundant on rocky parts of the coast just above limits reached by spray during storms, on east, north and west coasts; Little Coco, on rocks in similar situations at north end of island.

Cosmopolitan in the tropics.

175. *CAPSICUM MINIMUM* Roxb.

Table Island, in clearing, occasional, escape from the light-keeper's garden; Great Coco, throughout the clearing very abundant; unlike *Solanum Melongena* this is not confined to the clearing but is extending into the jungle much as *Carica Papaya* is.

India and Malaya; cultivated and frequent as an escape.

SCROPHULARINEÆ.

176. *SCOPARIA DULCIS* Linn.

Table Island and Great Coco; abundant in the clearings on both islands; introduced.

An American weed, now cosmopolitan in the tropics.

BIGNONIACEÆ.

177. *OROXYLUM INDICUM* Vent.

Little Coco, very plentiful at north-east corner of the island ; Great Coco, rare.

India, Ceylon ; Indo-China, Andamans ; Malaya.

178. *HETEROPHRAGMA ADENOPHYLLUM* Seem.

In all the islands, very common.

Assam and Eastern Bengal, Burma, Tenasserim ; Andamans.

ACANTHACEÆ.

179. *THUNBERGIA LAURIFOLIA* Lindl.

In all the islands, very common.

Arracan, Tenasserim, Malaya ; Andamans.

180. *HYGROPHILA QUADRIVALVIS* T. And.

Great Coco, abundant in the wet ground at the margin of the small lake and forming a continuous ring outside the belt of *Polygonum* growing at the water's edge.

India ; Andamans, Burma, Malaya.

181. *STROBILANTHES PHYLLOSTACHYUS* Kurz.

Great and Little Coco, a gregarious species common on most of the rocky promontories on the east coast of both islands.

Pegu, Tenasserim.

182. *ERANTHEMUM ALBUM* Nees.

Great Coco ; common in the beach-forests.

Chittagong, Burma ; Malaya ; Andamans, Nicobars.

183. *ERANTHEMUM CINNABARINUM* Wall., *var. SUCCISIFOLIA* Clarke (*E. SUCCIFOLIUM* Kurz.).

Great and Little Coco ; common in the beach-forest.

Nicobars.

These two species are recorded because in the large suite of specimens collected, some examples agree exactly with Andamans specimens named *E. album* by Dr. T. Anderson, and others agree exactly with the original specimens of Mr. Kurz's *E. succifolium*. But I do not think that there are really two species present. The plants are referred by Anderson to *E. album*, but are considered by Clarke a white-flowered fern of *E. cinnabarinum*, and are held by Kurz to be two distinct species. The original specimens of Kurz's *Eranthemum album*, T. And. ? (314 of Nicobars list) I cannot, however, distinguish from those of *E. succifolium* (313 of that list).

184. *RUNGIA PARVIFLORA* Nees, *var. PECTINATA* Clarke.

Table Island ; in the light-house clearing.

India, Burma, Andamans ; a weed, introduced.

185. *PERISTROPHE ACUMINATA* Nees.

Great Coco, very common on the east coast.

Tenasserim, Malaya ; Andamans.

VERBENACEÆ.

186. *LIPPIA NODIFLORA* Rich.

Little Coco, in swampy ground at west side of island, plentiful.

Cosmopolitan in the tropics.

187. *PREMNA INTEGRIFOLIA* Linn.

In all the islands, very common on the coast.

India, Ceylon ; Burma, Malaya ; Andamans, Nicobars ; on sea coasts.

188. *PREMNA* sp.

Great Coco ; a climber common on the western sea-face, also obtained on Rutland Island.

In fruit only ; almost certainly *P. obtusifolia*.

South Andaman, Malayan Archipelago, Australia.

189. *VITEX NEGUNDO* Linn.

Great Coco ; east coast, very rare ; Little Coco ; in salt marshes, extremely common.

Afghanistan, Tropical Asia, Philippines.

190. *VITEX PUBESCENS* Vahl.

Table Island ; common on north coast.

India, Burma, Malaya.

191. *VITEX WIMBERLEYI* Kurz.

Little Coco, not common.

Andamans.

192. *CLERODENDRON INERME* Gaertn.

In all the islands, extremely common on the coasts.

India, Burma, Tenasserim, Andamans and Nicobars.

193. *AVICENNIA OFFICINALIS* Linn.

Common in one mangrove swamp near south end of Great Coco ; elsewhere rare.

Indian, Malayan, and Polynesian sea-coasts.

LABIATÆ.

194. *ANISOMELES OVATA* R. Br.

Great Coco ; abundant in beach-forest at north end of island. This does not occur in the small clearing, but is very abundant in the jungle near it. It may have been introduced by man but is more probably indigenous ; it occupies much the same situations and is even more plentiful in Diamond Island. Not previously reported from the Andamans.

India, Burma, Malaya, China, Philippines.

INCOMPLETEÆ.

NYCTAGINEÆ.

195. *BOERHAAVIA REPENS* Linn.

In all the islands, common on every rocky promontory and on all the isolated rocks on the reefs not covered by the tides.

Cosmopolitan in the tropics.

196. *PISONIA ACULEATA* Linn.

In all the islands, one of the commonest climbers in the beach-forests.

Cosmopolitan in the tropics.

197. *PISONIA EXCELSA* Blume.

In all the islands, common in the beach-forests.

Andamans, Malaya.

AMARANTACEÆ.

198. *CELOSIA CRISTATA* Linn.

Table Island, an escape in the light-house clearing.

Cosmopolitan in the tropics.

199. *ACHYRANTHES ASPERA* Linn. *var. TYPICA.*

Table Island and Great Cocco, common in the clearings, introduced.

Cosmopolitan in the tropics.

var. PORPHYRISTACHYA Hook. f.

Little Cocco, very abundant in the beach-forests; stems 10–15 feet long, climbing over the sea-face jungle. A plant in habit remarkably unlike the preceding.

South-Eastern Asia.

200. *GOMPHRENA GLOBOSA*, Linn.

Table Island, an escape, but very plentiful and extending into the jungle.

Cosmopolitan in the tropics; probably originally American.

POLYGONACEÆ.

201. *POLYGONUM BARBATUM* Linn.

Great Cocco; this plant fringes the small lake at the north-east corner of the island, growing partly in and partly out of the water, just within it is a floating belt of *Panicum Myurus*, while outside is a ring of *Hygrophila quadrivalvis*. None occurs in the lake on Little Cocco.

Africa; India, Ceylon; Burma, Malaya.

ARISTOLOCHIACEÆ.

202. *BRAGANTIA TOMENTOSA* Blume.

Little Cocco; abundant on the interior ridges.

Tenasserim, Andamans; Java.

203. *ARISTOLOCHIA TAGALA* Cham. & Schlecht.

Both islands, frequent.

India, Burma, Malaya ; Nicobars.

PIPERACEÆ.

204. *PIPER CANINUM* Blume.

Great Coco.

Tenasserim, South Andaman, Malaya.

MYRISTICEÆ.

205. *MYRISTICA IRYA* Gaertn.

Great Coco ; frequent in interior towards eastern side.

Ceylon, Andamans, Tenasserim, Malaya.

206. *MYRISTICA GLAUCA* Blume.

Great Coco.

Burma, Andamans, Malaya.

LAURINEÆ.

207. *DEHAASIA KURZII* King.

Little Coco.

Tenasserim, Andamans.

208. *HERNANDIA PELTATA* Meissn.

In all the islands, on the eastern coasts.

East Africa, Madagascar ; Laccadives, Ceylon ; Andamans, Nicobars ; Mergui, Malaya, Archipelago ; North Australia ; Polynesia.

209. *CASSYTHA FILIFORMIS* Linn.

Great Coco, occasional ; Little Coco, extremely plentiful on all the coasts.

Cosmopolitan in the tropics.

LORANTHACEÆ.

210. *LORANTHUS LONGIFLORUS* Desrouss.

Great and Little Coco.

India, Ceylon ; Burma, Malaya ; Andamans.

SANTALACEÆ.

211. *CHAMPEREIA GRIFFITHIANA* Planch.

Both islands ; common on the coasts.

Tenasserim, Malaya ; Andamans, Nicobars.

EUPHORBIACEÆ.

212. *EUPHORBIA ATOTO* Forst.

In all the islands, very common on the sandy beaches.

India, Ceylon; Andamans, Nicobars; Malaya; Australia; China; Polynesia.

213. *EUPHORBIA PILULIFERA* Linn.

Table Island; in light-house clearing, still rare.

Cosmopolitan tropical and subtropical weed.

214. *BRIDELIA KURZII* Hook. f.

In all the islands, common on the western sea-face.

Nicobars.

215. *BRIDELIA TOMENTOSA* Blume.

Great Coco, common.

India; Burma; Andamans, Malaya; China; Philippines; North Australia.

216. *PHYLLANTHUS COLUMNARIS*, Muell.-Arg.

Table Island, common.

Pegu, Tenasserim.

217. *FLUEGGIA MICROCARPA* Blume.

Great Coco.

Africa; India, Ceylon; Assam, Burma, Malaya; Australia; China.

218. *CYCLOSTEMON ASSAMICUS* Hook. f.

In all the islands, a very common tree, gregarious where it occurs. Sikkim, Assam.

219. *APOROSA VILLOSULA* Kurz.

Great Coco.

Pegu, Tenasserim, Andamans.

220. *CROTON SUBLYRATUS* Kurz.

In all the islands, common in the beach-forests.

Andamans and (perhaps) Tenasserim.

221. *BLACHIA ANDAMANICA* Hook. f.

Great Coco, coasts, very common; Little Coco, frequent in beach-forests.

Andamans.

222. *CLAOXYLON LONGIFOLIUM* Muell.-Arg.

Great Coco.

Malaya.

223. *MALLOTUS ACUMINATUS* Muell.-Arg. (= *M. Helferianus* Kurz.).

Great Coco, common.

Tenasserim; Andamans; Malaya.

224. *MALLOTUS ANDAMANICUS* Hook. f.

Great and Little Coco; common, and, where it occurs, gregarious. Andamans.

225. *MACARANGA TANARIUS* Muell.-Arg.
Great Coco and Little Coco ; common in the beach-forests.
Arracan (Diamond Island) ; Andamans ; Malaya.
226. *CNESMONE JAVANICA* Blume.
Great Coco ; plentiful on rocky promontories at north end of island.
Bengal, Assam, Burma, Malaya.

URTICACEÆ.

227. *PHYLLOCLAMYS SPINOSA* Bureau.
Little Coco, common.
India, Ceylon ; Burma, Malaya ; Andamans.
228. *PLECOSPERMUM ANDAMANICUM* King.
Little Coco.
Tenasserim, Andamans.
229. *FICUS BENJAMINA* Linn.
Great Coco ; not in fruit, therefore the particular variety cannot be determined.
India, Assam, Burma, Andamans, Malaya.
230. *FICUS RUMPHII* Vahl.
Little Coco, on the east coast ; this species is here very rare. In Diamond Island, Arracan, this is one of the commonest trees on the coast.
India, Burma, Malaya, Andamans.
231. *FICUS RETUSA* Linn. *var. NITIDA* Thunbg. (sp). *F. comosa* Curtis, Bot. Mag., t. 3305 [1834].
In all the islands, very common. The fruits of this species, as Mr. Kendall, I. M., pointed out to me, is one of the favourite foods of a large pigeon, *Carphopaga bicolor*, which visits the group in enormous numbers during the cold weather.
India ; Burma ; Andamans, Malaya ; China ; Australia ; New Caledonia.
232. *FICUS BREVICUSPIS* Miq.
In all the islands, common. The fruits are borne both on young branches in leaf axils, and on old wood in bunches.
Andamans, Malaya.
233. *FICUS CALLOSA* Willd.
Great Coco.
India, Burma, Malaya.
234. *FICUS HISPIDA* Linn. f.
Great Coco, common.
India, Ceylon ; Burma, Malaya.
var. DÆMONUM Koenig (sp.).

Little Coco.

Distribution of type.

235. *FIGUS GRISEA* Wall. Cat. 4544.

Great Coco. Fruits of this a favourite food of the Green Parrots.
Burma. (Salween valley).

236. *ANTIARIS TOXICARIA* Leschen.

Great Coco.

India, Ceylon; Burma, Tenasserim, Malaya.

237. *ARTOCARPUS GOMEZIANA* Wall.

Great Coco and Little Coco, very common.

Tenasserim, Malaya, Andamans.

GYMNOSPERMÆ.

CYCADACEÆ.

238. *CYCAS RUMPHII* Miq.

In all the islands, very common in beach-forests, sometimes attains a height of 50 feet, and a girth of over 5 feet.

Tenasserim, Andamans, Nicobars; Malaya; North Australia, New Guinea.

MONOCOTYLEDONES.

ORCHIDACEÆ.

239. *DENDROBIUM SECUNDUM* Wall.

In all the islands, common. The only *very* common orchid on forest trees; specimen brought and flowered at Calcutta.

Martaban, Tenasserim; Penang, Sumatra, Java, Cochin China.

240. *CALANTHE VERATRIFOLIA* R. Br.

Great Coco, not uncommon on the interior ridges. The same species was also found, a few days later, on Rutland Island at the opposite end of the Andaman group.

India, Andamans, Malaya.

241. *DORTES WIGHTII* Benth. *var.* — ?

Great Coco, frequent on trees in the low, flat swampy land near the coast; specimens were brought and flowered at Calcutta. The foliage as well as the shape and markings of the flowers quite agree with those of the typical plant, but in the Coco Island specimens the flowers are distinctly larger and the ground colour is violet instead of yellow.

242. *AERIDES MULTIFLORUM* Roxb.

Great Coco, occasional near the sea.

India, Burma, Andamans, Malaya.

243. PHOLIDOTA IMBRICATA Lindl.

Great Coco, occasional.

India, Burma, Malaya.

SCITAMINEÆ.

244. COSTUS SPECIOSUS Linn.

Great Coco, frequent.

India, Himalaya, Indo-China, China, Malaya.

245. ZINGIBER sp.

Great Coco, common. Near *Z. corollinum* Hance; probably a new species (*Baker in sched.*). In fruit only on the occasion of these visits; the rhizomes brought to Calcutta have not yet flowered.

246. MUSA SAPIENTUM Linn.

The *Plantain* is cultivated in the light-house garden; it has already disappeared, probably owing to the presence of cattle, from the site of the garden on Great Coco.

AMARYLLIDACEÆ.

247. CRINUM ASIATICUM Linn.

In all the islands, very common in the coast zone.

Andamans, Nicobars, Malaya.

TACCACEÆ.

248. TACCA PINNATIFIDA Forst.

In all the islands, common in the coast zone. Some of these were huge specimens and the tubers brought to Calcutta produced leaves and flowers in no way inferior to those in their native habitat. The following measurements are from an average specimen—the tallest grown had a peduncle 116 inches high.

Leaf-stalk 40 inches, lamina 3-fid, each lobe 36 in. long, the lateral lobes 2-fid from the 8th inch; the central lobe and each segment of the lateral lobes 36 in. across; peduncle 80 inches; leafy bracts 3 in. long, 2 in. across; filiform bracts 16 in. long, their basal sixth green, the remainder pale purple; perianth segments $\frac{2}{3}$ in. long, $\frac{1}{3}$ in. across, pale green with purplish edges.

India, Burma, Malaya, Andamans,

DIOSCOREACEÆ.

249. DIOSCOREA GLABRA Roxb.

In all the islands, common.

India, Burma, Malaya, Andamans.

250. *DIOSCOREA PENTAPHYLLA* Linn.

In all the islands, common.

India, Ceylon, Burma.

LILIACEÆ.

251. *SMILAX MACROPHYLLA* Roxb.

In all the islands, common.

Eastern Himalaya, Assam, Arracan, Pegu.

252. *ASPARAGUS RACEMOSUS* Roxb.

Great Coco ; in low-lying lands behind the mangrove-swamps at north end of island.

India, Burma, Andamans, Java.

253. *DRACÆNA ANGUSTIFOLIA* Roxb.

Both islands ; small tree in coast zone.

India, Burma, Andamans, Malaya ; N. Australia.

254. *DRACÆNA SPICATA* Roxb.

In all the islands, frequent on interior ridges.

India, Burma, Malaya, Andamans, Nicobars.

255. *GLORIOSA SUPERBA* Linn.

Great Coco ; east coast, frequent.

Tropical Asia and Africa.

COMMELYNEÆ.

256. *POLLIA ZORZOGONENSIS* Endl.

Great Coco, rather common.

India, Burma, Andamans, Narcondam, Malaya.

257. *COMMELINA OBLIQUA* Hassk.

Great Coco. Seeds smooth, but only two in number in both specimens collected.

India, Burma, Malaya ; not before reported from the Andamans.

258. *ANEILEMA OVATUM* Wall.

Great Coco, Little Coco ; common.

Pegu, Tenasserim, Andamans.

FLAGELLARIÆ.

259. *FLAGELLARIA INDICA* Linn.

In all the islands, very common in beach-forests.

India, Indo-China, Andamans, Nicobars, Malaya ; Australia ; Mauritius.

PALMEÆ.

260. *CARYOTA SOBOLIFERA* Wall.

In all the islands, very common in beach-forests.

Indo-China, Andamans, Malaya.

261. *CORYPHA ELATA* Roxb., Flor. Ind. 2, 176; Griff., Ind. Palm. 112, t. 220 D.—*C. Gebanga* Kurz, Jour. As. Soc. Beng. 43, pt. 2, 206, nec Blume.—*C. macropoda* Kurz, l. c. 205, t. 15.

Great Coco, rare; Little Coco, very common.

This palm, which is very common in Little Coco and particularly so near the lake at the south-west corner of the island has leaf stalks up to 25 feet long and leaves up to 20 feet across and is clearly identical with Kurz's *C. macropoda*. But Kurz's plant does not appear to be specifically distinct from *C. elata*. Kurz has himself in his subsequent writings noted that his first impression that this is a stemless palm was erroneous, admitting that it has a stem at least 8—12 feet high. Moreover in Little Coco at least one example had reached a height of 60 feet and was not yet in flower in 1890, while in 1889 and 1890 Dr. King and myself obtained both flowering and fruiting specimens of Kurz's Andamanese *Corypha* near Port Blair; these prove the species to be *Corypha elata*. Kurz is, I believe, in error in identifying Roxburgh's *C. elata* with Blume's *C. Gebanga*, the two trees—as grown in Hort. Calcutta—are very different in appearance; the leaves of *C. Gebanga* are much paler in colour and Blume's figure of the inflorescence of *C. Gebanga* (Rumphia 2, tt. 97, 98 and 105) shows an open panicle that will not at all suit *C. elata*, which has a very dense inflorescence like a gigantic head of parsley. In any case Roxburgh's name (1832) has four years' priority and Kurz's reduction is, therefore, on that ground alone, untenable. The writer is of opinion, and Dr. King agrees, that the examples of *C. elata* in Hort. Calcutta may have been originally introduced from the Andamans and that the species is only there indigenous. At all events it has not hitherto been found wild in any part of India or Burma.

262. *LIVISTONA* sp.

Great Coco; occasional on inland ridges. This palm, the 3 or 4 examples of which met with were stemless or had stems under two feet high, seems to be nearly related to *L. Jenkinsiana* Griff., Palm. Brit. Ind. 128, t. 226 A. B. and to *L. speciosa* Kurz, Jour. As. Soc. Beng., 43, 2, 204, t. 13, 14, the differences between which species Mr. Kurz himself admits are not great. The Coco species may not of course be a dwarf one, but if it is not it seems remarkable that no tall examples were met with. The leaves are remarkably like those of *L. speciosa* and Mr.

Kurz's description would suit them very well except that the transverse veins are, in the Great Coco plant, even more prominent than in *L. speciosa*; the *ligula* however is very different.

Mr. Kurz does not describe the *ligula* in *L. speciosa*; it is, however, shewn (perfectly accurately) in t. 13, f. 5. as cordate and entire—just as it is in *L. Jenkinsiana*. In the species under review the *ligula* is larger, ovate orbicular, and armed at the margin with small but hard, flat black blunt spines, a character exhibited by no flabellate-leaved palm of which specimens are preserved in Calcutta Herbarium.

263. *CALAMUS ANDAMANICUS* Kurz.

In all the islands, common.

Andamans.

264. *CALAMUS TIGRINUS* Kurz.

In all the islands, common.

Andamans, Tenasserim.

265. *COCOS NUCIFERA* Linn.

In all the islands, extremely abundant. Probably not truly indigenous, though perhaps not intentionally introduced. It has long been known that this palm occurred on these islands; the name "Cocos Islands," applied to the group, is of older date than 1652, and it has often been the subject of remark that while this is so and while every island in the Nicobars, even uninhabited ones like Batti Malv, has Coco-nut trees, the species is altogether absent from the intervening Andaman islands. Kurz, in *Forest Flora Brit. Burma*, says the Coco-nut occurs on north-east Andaman also, but the writer is unable to ascertain on what authority, and the statement is contradicted by the officers of the settlement at Port Blair who alone know the coasts of the group intimately. There are here and there individual trees on the Andaman coasts now; Dr. Alcock tells me there is one on South Sentinel; the writer saw one on Rutland Island; Captain Simpson, Assistant Port Officer, Madras, tells me he recollects being in a small bay in one of the islands of the Eastern Andaman Archipelago where there are some trees. But all these are quite recent introductions and are mainly due to the humanitarian efforts of the officers of the Andamans who plant them when they visit various places along the coasts; the instance quoted by Captain Simpson is, however, attributed to a wreck. No explanation based on the set of currents in these seas is sufficient to explain the peculiar distribution of the Palm, and the writer is inclined to believe that the presence of the species in the Coco Islands is due to the wreck of some Coco-laden craft on their coasts.

Once established the species spreads with great rapidity. On Barren Island one tree was known in 1881; in 1891 thirteen were counted, of

which seven were bearing. In Narcondam there were in 1891 Coco-nut trees, many of them bearing, in 3 separate bays on the N. W., N., and N. E. aspects of the island respectively. These *may* have been brought from the Coco group by a strong North-East to South-West current that sets down on this island from the neighbourhood of that group, but I am inclined to think they owe their presence to an act of unrecorded piety on the part of some humane individual who has visited the island, for in the North Bay where the trees are most numerous, there is, just behind the coco-nut zone, a large patch of Plantains which clearly must have been introduced intentionally.

It should not be forgotten that at some remote period a colony may have been started in the Coco group and then abandoned. It is known that in recent times two such attempts have been made and that both have failed owing to the unhealthiness of the place. It may be that the Coco-nut was intentionally introduced on some similar occasion of which no record has been left. In any case, to speak of the coco-nut as "wild" here, as Mr. Kurz does (*Jour. As. Soc. Beng.*, xliii, Pt. 2, p. 200) is apt to convey the erroneous impression that the species is here truly indigenous.

The coco-nut cannot be said to be known in a truly wild state, though it occurs on many uninhabited islands, and its original home is by no means certain.

The quality of these coco-nuts is little inferior to that of those cultivated at Port Blair and though distinctly inferior to those cultivated in the Nicobars they are much the same as those on Batti Malv where there are no inhabitants.

America, Polynesia, Malaya, India.

PANDANEÆ.

266. *PANDANUS ODORATISSIMUS* Linn. f.

In all the islands, common on the coasts.

India, Indo-China, Malaya, Andamans, Nicobars.

AROIDEÆ.

267. *AMORPHOPHALLUS* sp. (aff. *A. bulbifer*).

Great Coco, common; Little Coco, occasional. Only leaves and very advanced fruit obtained; tubers brought to Calcutta have as yet only produced leaves, but these leaves are bulbiferous and indicate this as a species nearly related to, but apparently distinct from, both *A. bulbifer* and *A. tuberculiger*.

268. *ALOCASIA FORNICATA* Schott.

Great Coco, common.

India, Indo-China, Malaya, Andamans.

269. *SCINDAPSUS OFFICINALIS* Schott.

In all the islands, common.

India, Indo-China, Malaya, Andamans.

270. *POTHOS SCANDENS* Linn.

In all the Islands, common.

India, Indo-China, Malaya, Andamans.

NATADACEÆ.

271. *CYMODOECA CILIATA* Ehrh. ?

On the reefs of all the islands ; extremely common and forming vast submarine meadows. This species is exceedingly common in the Andamans and has been met with in equal abundance at Rangachang near Port Blair (there associated with another species of apparently the same genus), at Rutland Island, at Little Andaman (there in company with *Halophila ovalis*), and at Car Nicobar. No flowering or fruiting specimens have yet been reported at Calcutta. This is the plant supposed by Kurz (*Jour. As. Soc. Beng.*, xlv, Pt. 2, p. 154) to be a small form of *Enhalus aceroides*.

272. *ZANICHELLIA PALUSTRIS* Linn.

Little Coco, in the small lake along with *Chara fetida*.

Cosmopolitan in salt-marshes.

CYPERACEÆ.

273. *CYPERUS POLYSTACHYUS* Rottb.

Great Coco ; west coast, rather common on the bare grassy slopes.
Cosmopolitan.

274. *CYPERUS ELEGANS* Linn.

Great Coco ; frequent in wet patches in the dense interior jungle.
India, Indo-China, Malaya, Andamans ; America.

275. *CYPERUS DILUTUS* Vahl.

Great Coco ; occasional.

India, Indo-China, Malaya, Andamans.

276. *CYPERUS PENNATUS* Lamk.

In all the islands, very common on the coast in rocky places.

Sea-shores of the Indian Ocean.

277. *KYLLINGA BREVIFOLIA* Roxb.

Great Coco, clearing at north-east corner ; Table Island, clearing near light-house ; common.

India, Indo-China, Malaya, Andamans.

278. *FIMBRISTYLIS DIPHYLLA* Vahl.

Table Island and Great Coco, in the clearings ; also on the rocky coasts.

India, Burma, Malaya, Andamans ; Australia, Africa, America.

279. *FIMBRISTYLIS FERRUGINEA* Vahl.
Great Coco and Little Coco, on coral-shingle.
India, Burma, Malaya.
280. *FIMBRISTYLIS QUINQUEANGULARIS* Kunth.
Great Coco and Table Island, in marshy ground.
India, Indo-China, Malaya.
281. *FIMBRISTYLIS MILIACEA* Vahl.
Great Coco, flat marshy ground near the small lake.
India, Indo-China, Malaya.
282. *SCIRPUS SUBULATUS* Vahl.
Little Coco, in the lake at the south-west corner of the island,
abundant.
Bengal (Salt lakes); Beluchistan, Panjab; Africa, (Egypt).

GRAMINEÆ.

283. *PASPALUM SCROBICULATUM* Retz.
Little Coco, abundant in the lake.
India, Indo-China, Malaya.
284. *PANICUM CILIARE* Retz.
Great Coco, near south end of island.
India, Indo-China.
285. *PANICUM COLONUM* Linn.
Table Island, light-house clearing; Great Coco in the clearing, also
at south end of island in Coco-nut zone.
Cosmopolitan in the tropics.
286. *PANICUM HELOPUS* Trin.
Table Island, in the clearing.
India, Indo-China.
287. *PANICUM JAVANICUM* Poir.
Great Coco, common.
India, Indo-China, Malaya.
288. *PANICUM MYURUS* Lamk.
Great Coco; in matted manses floating in the small lake at north-
east corner of island.
India, Indo-China, Malaya.
289. *PANICUM MONTANUM* Roxb.
Great Coco, with the next species, in deep jungle.
India, Indo-China, Malaya, Andamans.
290. *OPLISMENUS COMPOSITUS* Roem. & Schult.
Great Coco, in dense jungle, occasional.
Cosmopolitan or nearly so.

291. *THUAREA SARMENTOSA* Pers.
Great Coco, common as a turf under Coco-nut trees.
Shores of Indian Ocean.
292. *ISCHÆMUM CILIARE* RETZ.
Great Coco, common on grassy slopes and under Coco-nut trees.
India, Indo-China, Malaya.
293. *ISCHÆMUM MUTICUM* Linn.
Great Coco, occasional only ; Little Coco, extremely abundant.
India, Indo-China, Malaya.
294. *ANDROPOGON CONTORTUS* Linn.
Table Island and Great Coco ; the common grass both in the clearings and on the naturally bare headlands of the western coast.
Cosmopolitan in the tropics.
295. *ELEUSINE INDICA* Gaertn.
Table Island, frequent ; Great Coco, rare.
Cosmopolitan in the tropics.
296. *ELEUSINE ÆGYPTIACA* Roxb.
Table Island ; in the light-house clearing, scarce.
Cosmopolitan, or nearly so, in the tropics.
297. *DENDROCALAMUS STRICTUS* Nees, *var.*— ?
Great Coco, on one hill, abundant ; Table Island, plentiful. Flowering examples were obtained on Table Island which have been kindly examined by Mr. J. S. Gamble. There seems no doubt as to the species, the specimens do not however quite agree with typical examples. There is little doubt that this Bamboo is here indigenous and, from an account received from Mr. Godwin-Austen (formerly of Port Blair), appears to occur on Saddle Peak in North Andaman also. It does not occur in South Andaman.
India, Burmah.

CRYPTOGAMÆ.

VASCULARES.

FILICES.

298. *DAVALLIA SOLIDA* Sw.
Great Coco, east coast, very common on *Mimusops littoralis* and other tall trees.
Andamans, Malaya, Polynesia, Australia.
299. *ADIANTUM LUNULATUM* Burm.
Great Coco, on interior ridges frequent ; Table Island, common.
Cosmopolitan in the tropics.

300. CERATOPTERIS THALICTROIDES Brogn.

Great Coco, in wet places in the interior with *Cyperus elegans*.

Cosmopolitan in the tropics.

When discussing the weeds of the Andaman Flora (*Jour. As. Soc. Beng.*) the writer imagined this fern to have been introduced into these islands by human agency, at least indirectly. But the Coco locality proves sufficiently to his mind that its presence is altogether independent of man's presence, and he has since then collected it in similar situations in South Andaman. It is probably not at all common however, and hence it had escaped the notice of Mr. Kurz when he collected in the Andamans.

301. POLYPODIUM IRIOIDES Lamk.

In all the islands, frequent.

India, Indo-China, Andamans, Malaya; Australia, Polynesia; Africa

302. POLYPODIUM ADNASCENS Sw.

Great Coco, on trees in mangrove swamps; Little Coco, on trees in lagoon at south-west end of island.

India, Indo-China; Andamans, Nicobars; Malaya; Polynesia; Africa.

303. POLYPODIUM QUERCIFOLIUM Linn.

In all the islands, very plentiful in the same situations as *Davallia solida*.

India, Indo-China; Andamans, Nicobars; Malaya; North Australia.

304. VITTARIA ELONGATA Sw.

Great Coco, not very common.

India, Indo-China; Andamans, Malaya; Australia, Polynesia; Africa.

305. ACROSTICHUM SCANDENS J. Sm.

Great Coco, very common in the low-lying lands behind the coast zone.

India, Indo-China; Andamans, Malaya; Australia, Polynesia.

306. ACROSTICHUM APPENDICULATUM Willd., var. SETOSA.

Great Coco, the only common ground fern on the interior ridges.

India, Indo-China; Andamans, Malaya.

307. LYGODIUM FLEXUOSUM Sw.; Bedd.

In all the islands, common in the dense dwarfed jungle on the ridges.

India, Burma; Andamans, Malaya; Australia; Africa.

CHARACEÆ.

308. CHARA FETIDA A. Braun.

Little Coco; abundant in the lagoon.

India, Indo-China.

MUSCI.

309. CALYMPERES DOZYANUM Mitt.

Great Coco, on damp rocks in a sheltered bay on west coast, also on *Mimusops* trunks in coast zone; Little Coco, on trunks of *Mimusops littoralis*.

Samoa; Java, Philippines; Ceylon; Admiralty Islands.

310. BRYUM CORONATUM Schwaegr.

Great Coco, on charred stumps of *Mimusops littoralis* at south end of island.

Tropics of both hemispheres.

HEPATICÆ.

311. LEJEUNIA sp.

In all the islands, on trees, common.

312. HEPATICA sp. (genus indeterminable).

Great Coco, on trees in mangrove swamps.

CELLULARES.

LICHENES.

313. COLLEMA NIGRESCENS Achar.

Little Coco, soft pulpy masses on stems of *Cycas Rumphii* Cosmopolitan.

314. PHYSCIA sp. (near *Ph. obscura* Fr.)

Little Coco, on stems of *Cycas Rumphii*.

315. PHYSCIA sp.

Great Coco, on rocks, west coast.

316. LEPRARIA sp. (specimens imperfect).

Great Coco.

FUNGI.

317. LENTINUS LEUCOCHROUS Fries.

Great Coco, on dead wood, common.

* Asia.

318. LENZITES DEPLANATA Fries.

Great Coco, on dead wood, common.

* Asia.

319. LENZITES SUBFERRUGINEA Berk.

Great Coco

* Asia.

320. *POLYPORUS FULVUS* Fries.
Great Coco.
* Asia.
321. *POLYPORUS XANTHOPUS* Fries.
Great Coco, on dead stems.
Cosmopolitan in the tropics.
322. *POLYPORUS SANGUINEUS* Fries.
Great Coco ; on dead stems of *Cocos nucifera*.
Cosmopolitan in the tropics.
323. *POLYPORUS GRAMMATOCEPHALUS* Berk.
Great Coco, on dead wood.
India, Indo-China, Malaya, Australia, America.
324. *POLYPORUS AUSTRALIS* Fries.
Great Coco.
Cosmopolitan in the tropics.
325. *HEXAGONA PERGAMENEA* Berk. & Broome.
Great Coco,
Ceylon (*Berkeley and Broome, Jour. Linn. Soc.* xiv, 57).
326. *HEXAGONA SRRICEO-HIRSUTUS* Kl.
Great Coco ; on dead wood.
North America (*Klotzsch, Linnæa* viii, 483).
327. *HEXAGONA TENUIS* Hook.
Great Coco, on dead wood.
Nicobars (*Fenzl, Novara Bot.* ii, 138) ; Mauritius (*Klotzsch, Linnæa* viii, 482).
328. *DEDELEA FLABELLUM* Berk.
Great Coco, on dead wood.
* Asia.
329. *DEDELEA SANGUINEA* Kl.
Great Coco, on dead wood.
India (*Klotsch, Linnæa* viii, 481).
330. *DEDELEA QUERCINA* Fries.
Great Coco, on dead wood.
Cosmopolitan.
331. *DEDELEA CONCENTRICA* Fries.
Great Coco, on dead wood.
Cosmopolitan in the tropics.
332. *THELEPHORA INCRUSTANS* Pers.
Great Coco, on *Pongamia glabra* ; Little Coco, on *Cycas Rumphii*.
Cosmopolitan.
333. *BOVISTA LILACINA* Berk.
Great Coco, on grassy slopes.
Cosmopolitan in the tropics.

334. *HIRNEOLA POLYTRICHA* Mont.

Great Coco, on dead wood.

Tropics of both hemispheres and Polynesia.

335. *XYLARIA CLAVARIOIDES* G. Massée, sp. nov.

Xylaria (*Xylocoryne*) stromatibus sæpius solitariis rarius in cæspitibus 2—5 connatis cylindræis, 2—4 cm. altis, $\frac{1}{3}$ — $\frac{1}{2}$ diam.; extus atris papilloso-scabris, intus candidis stipite elongato, coriaceo-suberoso nigro-velutino demum nudo; peritheciis clavulæ omnino immersis; ascis cylindricis, pedicellatis, octosporis; sporidiis oblique monostichis, ellipticis, nigricantibus 10—11 \times μ . (Prain n. 45). In lignis putridis.

Great Coco, common on dead stems of *Mimusops littoralis*.336. *DALDINIA VERNICOSA* Cos. & de Not.

Great Coco, on dead wood.

India, America.

337. *RHYTISMA* sp.In all the islands, on leaves of *Ficus brevicuspis*.

Andamans, (the same species apparently is equally common at Port Blair).

338. ———.

Besides the above there occurs on both islands a *Fungus* which appears to be very widely dispersed throughout the Andamans and Nicobars, but has so far been only found as a white mycelium that appears as a narrow band on the bark of slender branches, runs upwards along these and divides into still narrower bands on the branchlets; these branch and anastomose and send still narrower bands (threads) upwards along the petioles of the leaves and finally spread as a thin network on the *under* surface of the lamina. The writer has found the same blight (known to the officers at Port Blair as "thread-blight") on the following species: *Alsodeia bengalensis*, *Ochna squarrosa*, *Bombax insigne*, *Camellia theifera*, *Hibiscus rosa-sinensis*, *Gardenia* sp., *Pongamia glabra*, *Diplospora singularis*, *Blachia andamanica*, *Ficus nitida*; it is also reported to occur on a species of *Phalenopsis*. Its effect is in every case the same, the leaves affected become yellow and sickly, and as regards *Ochna* among indigenous species and the Tea-plant among cultivated species, when affected they become brown and die. The blight spreads with great rapidity and for a time threatened the existence of the Tea-industry at Port Blair. Drs. Cunningham and Barclay have both examined specimens but as there is no sign of any advance beyond the mycelial stage the position of the *Fungus* is at present indeterminable.

339. ———.

A second fungus of some interest is an *Uredine* that was found in considerable quantity on *Clerodendron inerme*. This the writer has met with, always producing the same characteristic effects on this *Clerodendron*, in South Andaman, Little Andaman, and Car Nicobar, as well as on Great Coco. The specimens were examined by the late Dr. Barclay, but were found insufficient for determination.

340. ———.

A third fungus of note causes a "dry-rot" in the fallen trunks of *Mimusops littoralis* on the beach. The effect produced simulates in a wonderful manner charring by fire; it appears to be confined, so far as the drift timber and wreckage on these islands is concerned, to *Mimusops* and *Quercus*—the planks of a wooden vessel, apparently of oak, that had been wrecked on Little Coco, being attacked like the Bullet-wood trees; Teak, Sundri and other logs were not affected.

ALGÆ.

341. *SARGASSUM ILICIFOLIUM* J. Agardh.

In all the islands; in great beds at the outer margins of the fringing reefs and in the deeper water beyond; the only really common sea-weed.

Almost Cosmopolitan in the tropics; not from Australia (*Hemsl., Report on Bot. of Admiralty Islands*, p. 271).

342. *TURBINARIA ORNATA* J. Agardh.

In all the islands; rather common both on coral and on sandstone reefs.

* Indian Ocean.

343. *PADINA PAVONIA* Gaill.

In all the islands; on both coral and sandstone.

Cosmopolitan in tropical seas.

344. *DICTYOTA DICHOTOMA* Lamour.

Great Coco; on coral reefs.

Common in both north and south temperate seas, rarer in the tropics.

345. *LITHOTHAMNION POLYMORPHUM* Aresch.

Great Coco; on coral reefs.

Atlantic, Mediterranean, South Africa; Chonos Archipelago.

346. *ACANTHOPHORA THIERII* Lamour.

Little Coco; pools on coral reefs.

Cosmopolitan in tropical seas.

347. *JANIA TENELLA* Kuetz.

Great Coco; on reefs, on *Lithothamnion polymorphum*.

* Indian Ocean.

348. *GRACILARIA CRASSA* Harv.

In both islands ; in pools on coral sand.

* Indian Ocean.

349. *GELIDIUM CORNEUM* J. Agardh.

Great Coco ; on coral reefs ; also growing on *Halimeda Opuntia*.

Almost Cosmopolitan.

[A specimen of a *Gelidium* washed up by the tide on Little Coco, was too much withered and bleached to be identified ; another was collected there on the reefs, but in too early a stage of development to be named.]

350. *CAULERPA CLAVIFERA* J. Agardh.

Both islands ; on reefs.

Cosmopolitan in tropical seas.

351. *CAULERPA PLUMARIS* J. Agardh.

Little Coco ; in pools on coral reefs.

* Indian Ocean.

352. *VALONIA FASTIGIATA* Harv.

Great Coco ; on coral reefs.

Indian Ocean and Pacific.

353. *VALONIA CONFEROIDES* Harv.

Great Coco ; in pools on coral sand.

* Indian Ocean.

[A species of *Valonia* was collected on Little Coco also, but in too early a stage of development to be named].

354. *HALIMEDA OPUNTIA* Lamour.

In both islands ; both on sandstone and on coral reefs, rather common.

Cosmopolitan in tropical seas.

355. *SIPHONOCADUS* ? *FILIFORMIS* De Toni.

Washed ashore on the coast of Little Coco after stormy weather that prevailed for three days during our visit.

356. *VAUCHERIA* sp.

Little Coco ; on sandstone reefs. None of the specimens obtained were in fruit.

Andamans and Nicobars, the same species apparently was found by the writer to be plentiful in South Andaman and in Car Nicobar.

357. *CALOTHRIX PULVINATA* J. Agardh.

Little Coco ; in pools above high water mark.

Cosmopolitan.

358. ———.

A *Nostocaceous Alga* in habit, very like the preceding, was obtained

in the shallower *tidal* pools on Great Coco, but the specimens were too much withered to be determinable.

[Where an asterisk precedes the distribution of any *Fungus* or *Alga* it has been impossible to ascertain whether the species in question extends beyond the area indicated].

§ § § NATURE, DISTRIBUTION, AND PROBABLE ORIGIN OF THE FLORA.

In this list 358 distinct species are recorded, distributed among 268 genera and 95 natural orders; 297 species are *Phanerogams* and 61 are *Cryptogams*, giving a proportion of nearly five flowering plants to one flowerless species, the exact proportions and percentages being :—

Phanerogams : Cryptogams :: 4·85 : 1.

Phanerogams = 83 %; Cryptogams = 17 %.

In the two groups *Filices* and *Algæ* the list represents the *Cryptogamic* flora with probably the same degree of adequacy that it does the *Phanerogamic*. In the other *Cryptogamic* groups it is to be feared the representation is not so complete. Still the scarcity of *Mosses* and *Lichens* is a very striking feature of the flora, so is the paucity of *Ferns*; with all three groups it is not merely a case of few species being present, there are, except perhaps in the case of *Acrostichum scandens*, which is common, remarkably few individuals of these species.

Among the 297 *Phanerogams*, 238 are *Dicots*; only one of these (*Cycas Rumphii*) is a *Gymnosperm*, the other 59 being *Monocots*. The *Dicots* are distributed amongst 59 natural orders and 178 genera, the *Monocots* amongst 14 natural orders and 45 genera. The proportions and percentages here are :—

Dicots : Monocots :: 4 : 1.

Dicotyledons = 80 %; Monocotyledons = 20 %.

Altogether 66 per cent. of the flora consists of *Dicotyledons*, whilst among these the *Polypetalæ* exceed in number the rest of the groups combined, a somewhat unusual circumstance, since, as regards species at least, the Indian *Gamopetalæ* usually exceed the *Polypetalæ*; *Polypetalæ* here constitute, as it happens, one-third, or 33 % of the whole flora.

There are only 15 *Vascular Cryptogams* in the list as against 46 *Cellular Cryptogams*; these are together distributed amongst 45 genera and 22 natural orders; The proportions and percentages are :—

Vascular : Cellular :: 1 : 3.

Vascular Cryptogams = 25 %; Cellular Cryptogams = 75 %.

The subjoined table gives a synoptic view of the systematic disposition of the Coco Island Flora.

TABLE I. *Systematic synopsis of Coco Island orders, genera and species.*

PHANEROGAMÆ	73	223	297
<i>Dicotyledones</i>	59	178	238
Angiospermæ	58	177	237
Polypetalæ	30	86	119
Thalamifloræ	10	19	31
Discifloræ	10	29	33
Calycifloræ	10	38	55
Gamopetalæ	17	59	75
Incompletæ	11	32	43
Gymnospermæ	1	1	1
<i>Monocotyledones</i>	14	45	59
CRYPTOGAMÆ	22	45	61
<i>Vasculares</i>	8	12	15
Filices	4	7	10
Characeæ	1	1	1
Musci	1	2	2
Hepaticæ	2	2	2
<i>Cellulares</i>	14	33	46
Lichenes	2	3	4
Fungi	7	14	24
Algæ	5	16	18
TOTAL	NAT. ORDERS 95	Genera..... 268	Species..... 358

Of the 73 natural orders of *Phanerogams* 24 are represented by single species and 14 more by two species each. The most extensively represented natural order is *Leguminosæ*, with 34 species; followed after a long interval by *Euphorbiaceæ* and *Gramineæ*, each 15 sp.; *Convolvulaceæ*, 14 sp.; *Rubiaceæ*, 13 sp.; *Urticaceæ*, 11 sp.; *Cyperaceæ*, 10 sp. *Filices*, amongst *Cryptogams*, are also represented by 10 species. None of the other orders have more than 8 species.

As to genera: 29 of these natural orders of *Phanerogams* are represented by one genus; 13 by 2 genera; 11 by 3 genera; 6 by 4 genera; 5 by 5 genera; 4 by 6 genera; one natural order each where there are 7 genera (*Apocynæ*); 8 genera (*Gramineæ*); 11 genera (*Rubiaceæ*); 12 genera (*Euphorbiaceæ*); and 22 genera (*Leguminosæ*): *Leguminosæ* thus leads both as regards genera and species. The subjoined table exhibits the relationship of the orders according to the wealth of their representation.

TABLE II. *Natural orders of Coco Island Phanerogams arranged according to their richness in species.*

Number of species.	Number of orders.	NAMES OF ORDERS.
34	1	<i>Leguminosæ.</i>
15	2	<i>Euphorbiaceæ, Gramineæ.</i>

Number of species.	Number of orders.	NAMES OF ORDERS.
14	1	<i>Convolvulaceæ.</i>
13	1	<i>Rubiaceæ.</i>
11	1	<i>Urticaceæ.</i>
10	1	<i>Cyperaceæ.</i> [<i>Filices</i> are also represented by 10 species.]
8	3	<i>Malvaceæ, Sterculiaceæ, Verbenaceæ.</i>
7	3	<i>Compositæ, Apocynæ, Acanthaceæ.</i>
6	2	<i>Anacardiaceæ, Palmææ.</i>
5	6	<i>Ampelideæ, Sapindaceæ, Rhizophoreæ, Combretaceæ, Orchidaceæ, Liliaceæ.</i>
4	4	<i>Tiliaceæ, Meliaceæ, Asclepiadaceæ, Aroideæ.</i>
3	10	<i>Olacineæ, Celastrineæ, Rhamnææ, Lythraceæ, Solanaceæ, Nyctagineæ, Amarantaceæ, Laurineæ, Scitamineæ, Commelynaceæ.</i>
2	14	<i>Menispermaceæ, Capparideæ, Guttifereæ, Dipterocarpeæ, Burseraceæ, Myrtaceæ, Passifloraceæ, Myrsinææ, Boraginææ, Bignoniaceæ, Aristolochiaceæ, Myristicææ, Dioscoreaceæ, Naiadeæ.</i>
1	24	<i>Anonaceæ, Nymphæaceæ, Violaceæ, Rutaceæ, Moringææ, Connaraceæ, Melastomaceæ, Cucurbitaceæ, Ficoidææ, Goodenovieæ, Sapotaceæ, Ebenaceæ, Gentianaceæ, Scrophularinææ, Labiatæ, Polygonaceæ, Piperaceæ, Loranthaceæ, Santalaceæ, Cycadaceæ, Amaryllidaceæ, Taccaceæ, Flagellariceæ, Pandanaceæ.</i>

If the species are classified according to their habit we find that 78 are climbers, 74 are trees that may exceed 30 feet in height, 20 are small trees that do not exceed 30 feet, 48 are shrubs and 138 are herbaceous, (treating as herbaceous species like *Carica*, *Sceevola*, *Musa*, *Crinum*, etc., and all *Cryptogams* except the two climbing ferns, *Lygodium* and *Acrostichum scandens*, which are here included among the other climbers). But though as regards number of species herbaceous forms are so largely represented they are as a matter of fact extremely inconspicuous, two-fifths of them being cryptogams and one-third of these being marine. Nor, if we except the herbaceous climbers, which are here dealt with along with the woody ones, and the species that occur on the few bare grassy slopes, are herbaceous phanerogams more numerous than herbaceous cryptogams. The most numerous represented herbs are *Andropogon contortus*, *Desmodium polycarpon*, *Desmodium triquetum*, *Vernonia cinerea*, *Blumea virens*, the various species of *Fimbristylis*, *Cyperus pennatus* and *polystachyus*, *Boerhaavia repens*, *Ischaemum muticum*, *Thuarea sarmentosa*. Herbaceous species that frequent deep

jungle only, such as *Desmodium laxiflorum*, *Urena lobata*, *Cyperus elegans*, *Oplismenus compositus*, *Panicum montanum*, *Alocasia fornicata*, *Costus speciosus*, *Zingiber* sp., *Amorphophallus* sp., *Acrostichum appendiculatum*, *Ceratopteris thalictroides*, etc., are not only very rarely met with, but are represented by extremely few individuals where they do occur.

Woody shrubs and small trees taken together do not, as regards species, quite equal in number the large trees. In point of number of individuals, however, this is not the case, for it is not unusual to find these, woody shrubs and the smaller trees truly gregarious, particularly on the ridges; the chief examples are *Glycosmis pentaphylla*, *Alsodeia bengalensis*, *Glyptopetalum calocarpum*, *Cyclostemon assamicus*, *Macaranga Tanarius*, *Miliusa* sp., *Cynometra ramiflora*, *Leea sambucina*, *Dendrocalamus strictus*; a far larger area is covered by small trees and woody undershrubs heavily loaded with creepers than is covered by tall forest. In the mangrove-swamps most species may be spoken of as gregarious, but even here there is no great number of trees over 40 feet high; and the only gregarious tall trees are *Minusops littoralis* and *Gyrocarpus Jacquinii*, both denizens of the beach-forest behind the Coco-nut zone, and *Cocos nucifera* itself. Among the arboreous species in these islands have to be included *Cycas Rumphii*, which is very commonly 30—35 feet high and of which one specimen measured in Great Coco had a clear stem from ground to crown of 42 feet; also *Tournefortia argentea* which in Little Coco (and elsewhere in the Andaman group) is a tree 25—40 feet high with very black bark and a trunk often 3—3½ feet in girth; *Pongamia glabra* too, recorded by Mr. Baker in the *F. B. I.* as sometimes a climber, is here, as it also is in Bengal, always a tree from 20—60 feet in height. *Salacia prinoidea* on the other hand is here always a heavy extensive climber.

Erect woody species therefore, including both trees and shrubs in this category, form almost exactly two-sevenths of the flora as regards number of species. As regards individuals, however, it will be no over-estimation to say that these constitute six-sevenths of the vegetation, not merely in bulk but in actual number of individuals.

Climbing species, as compared with those having an erect or prostrate habit, show a much higher proportion of woody to herbaceous species. This is owing to the fact that of the 78 climbers only two are cryptogams, while in the other group 59 cryptogams are included. To give therefore an accurate conception of the conditions that prevail, the Cellular cryptogams ought to be excluded. Of the 312 Phanerogams and Vascular cryptogams 234 are of erect habit and 78 are climbing, giving a proportion of:—

Erect sp. : climbing sp. : : 4 : 1.

Among these erect vascular plants the proportion of woody to herbaceous is therefore :—

Woody sp. : Herbaceous sp. : : 3 : 2.

Of the climbers 35 are woody and 43 are herbaceous so that here the proportion is :—

Woody sp. : Herbaceous sp. : : 2 : $2\frac{1}{2}$.

Instead therefore of being lower amongst climbers than erect species, the proportion of herbaceous species to woody ones, when attention is confined to vascular plants only, is actually higher. And in number of individuals too there is a much more even balance among climbing species, since herbaceous climbing species, as well as woody ones, can easily raise themselves to the light and air for want of which no great quantity of herbaceous undergrowth can exist; indeed the herbaceous climbing species possess many advantages over their woody rivals, for they are not as a rule so heavy and as, moreover, they sometimes (*e. g.*, *Modecca*, *Trichosanthes*, *Dioscorea*, *Gloriosa*) die down annually, they do not destroy the species on which they are supported so soon as do heavy perennial creepers like *Calamus*, *Thunbergia*, *Anodendron*, *Chonemorpha*, *Derris*, etc., which in a few seasons drag down the trees on which they climb.

Some of the woody climbers, such as *Anodendron* and *Thunbergia*, climb to great heights, and are not surpassed in this respect even by the *Modecca*. The majority of the woody climbers, however, like *Sarcostigma*, *Salacia*, *Pisonia aculeata*, *Plecosperrum*, the species of *Acacia* and of *Capparis*, are not to be found on tall trees at all, but load heavily the woody undergrowth of small trees and shrubs that forms the bulk of the forest. Nor is it unusual to find the forest, where composed of tall trees, exhibiting both classes of creepers; the characteristic lofty creepers on the tall trees overhead, the heavy woody creepers on the shrubby undergrowth below.

Of the climbing species 20, or 25%, are armed. As a rule the armed species may be said to belong to the class of undergrowth climbers; with the exception of the two species of *Calamus*, the lofty climbers are unarmed.

The habit of the Coco Island species is shewn in the subjoined table.

TABLE III. *Habit of Coco Island species.*

Vascular species (Phanerogams and Vascular Cryptogams).....	312
Species with erect habit	234
Woody species	142
Trees	94
Exceeding 30 feet.....	74
Under 30 feet	20
Shrubs.....	48
Herbaceous species (Herbs and Herbaceous shrubs).....	92
Climbing species	78
Woody climbers	35
Armed.....	13
Unarmed.....	22
Herbaceous climbers	43
Armed	7
Unarmed	36
Non-vascular species (Lower Cryptogams)	46
Total Coco Island species ...	358

As regards habitat it will be gathered from what has been said above that a very large proportion of the flora is of arborescent forest-type. Next in point of numbers to the inland forest species, though only half as numerous, are the litoral species; following these at about an equal interval are parasitic or saprophytic species—a class here almost entirely composed of *Fungi*; after these in succession epiphytes; marine species, (mainly *Algæ*); weeds of cultivation; cultivated species; marsh or water plants; and species of open grassy slopes.

The subjoined table gives the numbers of each class of species; the meadow species, here separated from the forest species, are, owing to the smallness of their numbers, in all subsequent tables included with the forest species.

TABLE IV. *Habitat of Coco Island species.*

Civilized species	33
Cultivated plants	15
Weeds of cultivation	18
Wild species.....	325
Parasites and Saprophytes (Phanerog. 1)	31
Epiphytes	19
Marine plants (Phanerog. 1)	19
Littoral species	80
Inland species	176
Forest species	162
Jungle	150
Grassy species	12
Marsh and water species	14
Total Coco Island species ...	358

The subjoined table exhibits the relationship that subsists between the systematic disposition of the species and their habit and habitat.

TABLE V. *Relationship between systematic arrangement, habit and habitat.*

HABIT.					SYSTEMATIC ARRANGEMENT.	HABITAT.									
Total.	Climbers.	Trees.	Shrubs.	Herbs.		Cultivated sp.	Weeds.	Forest sp.	Marsh.	Littoral.	Marine.	Epiphytic.	Parasiticete.	Total.	
1	1				Anonaceæ ...			1						1	
2	2				Menispermaceæ ...			2						2	
1				1	Nymphæaceæ ...				1					1	
2	2				Capparideæ ...			2						2	
1	1	1			Violaceæ ...			1						1	
2	2	2			Guttiferæ ...			1	1					2	
2	2	2			Dipterocarpeæ ...			2						2	
8	3	2	3		Malvaceæ ...	2	2	2	2					8	
8	1	7			Sterculiaceæ ...			6	2					8	
4	1	3			Tiliaceæ ...			4						4	
1		1			Rutaceæ ...			1						1	
2	2	2			Burseraceæ ...			2						2	
4	4	4			Meliaceæ ...			3	1					4	
3	2	1			Olaceinæ ...			3						3	
3	1	1			Celastinææ ...			2	1					3	
3	3				Rhamnææ ...			2	1					3	
5	3	2			Ampelideæ ...			4	1					5	
5	4	1			Sapindaceæ ...			5						5	
6	6				Anacardiaceæ ...			5	1					6	
1	1				Moringææ ...	1								1	
1	1				Connaraceæ ...			1						1	
34	18	6	7	3	Leguminosæ ...	3	2	19	10					34	
5	5				Rhizophoreæ ...				5					5	
5	1	3	1		Combretaceæ ...			2	3					5	
2	2				Myrtaceæ ...				2					2	
1		1			Melastomaceæ ...			1						1	
3	2	1			Lythraceæ ...			2	1					3	
2	1		1		Passifloreæ ...	1		1						2	
1	1				Cucurbitaceæ ...			1						1	
1				1	Ficoideæ ...				1					1	
13	2	6	5		Rubiaceæ ...			9	4					13	
7	1	1	5		Compositæ ...		3	2	2					7	
1			1		Goodenovieæ ...				1					1	
2	2				Myrsinææ ...				1					1	
1	1				Sapotaceæ ...				1					1	
1	1				Ebenaceæ ...			1						1	
7	2	2	2	1	Apocynææ ...			4	3					7	
4	4				Asclepiadaceæ ...				1	3				4	
1			1		Gentianaceæ ...				1					1	
2	2				Boraginææ ...				2					2	
14	14				Convolvulaceæ ...	2		3	9					14	
3		1	2		Solanaceæ ...	2			1					3	
1			1		Scrophularinææ ...		1							1	
2	2				Bignoniaceæ ...			2						2	
7	1		6		Acanthaceæ ...		1	3	1	2				7	

HABIT.					SYSTEMATIC ARRANGEMENT.	HABITAT.								
Total.	Climbers.	Trees.	Shrubs.	Herbs.		Cultivated	sp.	Weeds.	Forest sp.	Marsh.	Littoral.	Marine.	Epiphytic.	Parasitic.
8	2	3	2	1	Verbenaceæ ...	...	...	...	2	1	5	...	...	8
1	...	...	...	1	Labiatae ...	...	...	...	...	1	...	...	...	1
3	1	1	...	1	Nyctagineæ ...	...	...	...	...	3	...	...	...	3
3	...	...	...	3	Amarantaceæ ...	...	2	1	...	...	...	...	...	3
1	...	...	...	1	Polygonaceæ ...	...	...	...	1	...	...	...	...	1
2	1	...	...	1	Aristolochiaceæ ...	...	...	...	2	...	...	...	...	2
1	1	...	...	...	Piperaceæ ...	...	...	...	1	...	...	...	...	1
2	...	2	...	...	Myristicææ ...	...	...	...	2	...	...	...	...	2
3	1	2	...	...	Laurinææ ...	...	...	...	1	1	...	1	...	3
1	...	...	...	1	Loranthaceæ ...	...	...	...	...	...	...	...	1	1
1	...	1	...	...	Santalaceæ ...	...	...	...	...	1	...	...	...	1
15	...	13	2	...	Euphorbiaceæ ...	...	...	1	13	1	...	...	...	15
11	10	...	...	...	Urticaceæ ...	...	...	...	11	...	...	...	...	11
1	...	1	...	...	Cycadaceæ ...	...	...	...	...	1	...	...	...	1
5	...	...	5	...	Orchidaceæ ...	...	...	...	1	...	...	4	...	5
3	...	...	3	...	Scitamineæ ...	...	1	...	2	...	...	...	...	3
1	...	...	1	...	Amaryllidaceæ ...	...	...	...	...	1	...	...	...	1
1	...	...	...	1	Taccaceæ ...	...	...	...	...	1	...	...	...	1
2	2	...	...	...	Dioscoreaceæ ...	...	...	...	2	...	...	...	...	2
5	3	...	1	1	Liliaceæ ...	...	...	...	4	1	...	...	...	5
3	...	...	3	...	Commelynaceæ ...	...	...	...	3	...	...	...	...	3
1	1	...	...	...	Flagellariææ ...	...	...	...	...	1	...	...	...	1
6	2	3	1	...	Palmeæ ...	...	1	...	4	1	...	...	...	6
1	...	...	1	...	Pandanaceæ ...	...	...	...	...	1	...	...	...	1
4	2	...	2	...	Aroidææ ...	...	...	...	2	...	...	2	...	4
2	...	...	2	...	Naiadaceæ ...	...	...	...	1	1	...	...	...	2
10	...	...	10	...	Cyperaceæ ...	...	...	2	3	4	1	...	...	10
15	...	1	14	...	Gramineæ ...	...	...	5	6	2	2	...	...	15
10	2	...	8	...	Filices ...	...	...	...	1	1	...	8	...	10
1	...	...	1	...	Characeæ ...	...	...	...	1	...	...	...	...	1
2	...	...	2	...	Musci ...	...	...	...	...	...	...	2	...	2
2	...	...	2	...	Hepaticææ ...	...	...	...	...	...	...	2	...	2
4	...	...	4	...	Lichenes ...	...	...	...	...	...	...	...	4	4
24	...	...	24	...	Fungi ...	...	...	...	1	...	...	23	...	24
18	...	...	18	...	Algæ ...	...	...	...	...	...	18	...	...	18
358	78	94	48	138	TOTALS	...	15	18	162	14	80	19	21	358

In considering the distribution of the species in this list it has to be borne in mind that the islands in which they have been collected form an integral portion of the phytogeographic province of South-Eastern Asia—an area comprising the Indian Peninsula and Ceylon, the lower slopes of the Himalaya—particularly its eastern and central portion, South China, Indo-China and Malaya. To this area too apparently ought to be added, at least as regards many littoral species and many

species with succulent fruits, Northern Australia. While, therefore, in the table of distribution the occurrence of the species in the large divisions of the globe are given on the left hand side, on the right hand the distribution within South-Eastern Asia itself is given. Further, since the geographical position of these islands indicates that they are an integral portion of the Andaman chain, and as the Andamans altogether form as it were part of the debatable land between Indo-China and Malaya, the occurrence of the species there is also noted. In all cases where the occurrence of a species in the Andamans is, at least so far as we yet know, only due to its presence in the Coco Islands, the species in question is indicated by [] brackets. The other debatable territory, so far as Malaya and Indo-China are concerned, is Tenasserim, and in all cases where the occurrence of a Coco Island species in Indo-China depends entirely on its occurrence in Tenasserim it is marked by the same [] brackets in the Indo-Chinese column. Similarly when, as is frequently the case, a species is only African in the sense of occurring in the Mascarene Islands, the same [] brackets are used in the African column.

TABLE VI. *Distribution of the species observed in the Coco Group.*

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Section.			Eastn. Section.					Africa.	S. E. Asia.	Australia.	Polynesia.	America.
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.						
|	x	|	|	|	x	|	Milusa sp.	...	|	x	|	|
|	x	|	|	|	x	x	Cyclea peltata	...	|	x	|	|
|	x	|	|	|	x	x	Antitaxis calocarpa	...	|	x	|	|
|	x	|	|	|	x	x	Nymphæa Lotus	...	|	x	|	|
|	|	|	|	|	x	x	Capparis sepiaria var.	...	|	|	|	|
|	|	|	|	|	|	|	grandifolia	...	|	|	|	|
|	|	|	|	|	x	x	Capparis tenera var. latifolia	...	|	x	|	|
|	|	|	|	|	[x]	|	Alsodeia bengalensis	...	|	x	|	|
|	x	|	|	|	x	x	Garcinia sp.	...	|	|	|	|
|	x	|	|	|	x	x	Calophyllum inophyllum	...	[x]	x	|	|
|	|	|	|	|	x	x	Dipterocarpus pilosus	...	|	x	|	|
|	|	|	|	|	x	x	Dipterocarpus alatus	...	|	|	|	|
x	x	x	x	x	x	x	Sida acuta	...	x	x	x	x
x	x	x	x	x	x	x	Urena lobata	...	x	x	x	x
x	x	x	x	x	x	x	Hibiscus Sabdariffa	...	x	x	x	x
x	x	x	x	x	x	x	Hibiscus Abelmoschus	...	x	x	x	x
x	x	x	x	x	x	x	Hibiscus tilliaceus	...	x	x	x	x
|	x	|	|	x	x	x	Thespesia populnea	...	|	x	|	|
|	|	|	|	x	|	|	Bombax insigne	...	|	x	|	|

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.					
Westn. Section.			Eastn. Section.					Africa.	S. E. Asia.	Australia.	Polynesia.	America.	
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.							
x	x	x	x	x	x	x	Eriodendron anfractuosum ...	x	x	-	-	-	x
-	-	-	-	-	[x]	-	Sterculia villosa ...	-	-	x	-	-	-
-	-	-	-	-	x	-	Sterculia rubiginosa var. glabrescens ...	-	-	-	-	-	-
-	-	-	-	-	x	x	Sterculia parviflora ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Sterculia alata ...	-	-	x	-	-	-
-	-	-	-	-	[x]	-	Sterculia colorata ...	-	-	-	-	-	-
-	-	-	-	-	x	x	Sterculia campanulata ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Heritiera littoralis ...	x	x	x	x	-	-
-	-	-	-	-	[x]	x	Buettneria andamanensis ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Berrya Ammonilla ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Grewia laevigata ...	-	x	x	-	-	-
-	-	-	-	-	-	-	Grewia calophylla ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Grewia Microcos ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Glycosmis pentaphylla ...	-	-	-	x	-	-
-	-	-	-	-	x	x	Garuga pinnata ...	-	-	x	-	-	-
-	-	-	-	-	-	x	Canarium euphyllum ...	-	-	x	-	-	-
-	-	-	-	-	x	-	Aglaia andamanica ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Amoora Rohituka ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Carapa moluccensis ...	-	x	x	x	-	-
-	-	-	-	-	x	x	Chickrassia tabularis ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Cansjera Rheedii ...	-	-	x	x	-	-
-	-	-	-	-	x	x	Phlebocalymna Lobbiana ...	-	-	x	-	-	-
-	-	-	-	-	-	-	Sarcostigma Wallichii ...	-	-	x	-	-	-
-	-	-	-	-	[x]	[x]	Glyptopetalum calcearpum ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Salacia prinoides... ..	-	-	-	-	-	-
-	-	-	-	-	[x]	[x]	Siphonodon celastrineus ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Ventilago calyculata ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Zizyphus Enopia ...	-	-	x	x	-	-
-	-	-	-	-	x	x	Colubrina asiatica ...	-	x	x	x	-	-
-	-	-	-	-	x	-	Vitis pentagona ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Vitis carnosia ...	-	-	-	x	-	-
-	-	-	-	-	x	x	Vitis pedata ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Leea sambucina ...	-	x	x	x	-	-
-	-	-	-	-	x	x	Leea hirta ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Erioglossum edule ...	-	-	x	x	-	-
-	-	-	-	-	x	x	Allophylus Cobbe ...	-	-	x	x	-	-
-	-	-	-	-	[x]	-	Sapindus Danura ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Pometia tomentosa ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Dodonaea viscosa ...	-	x	x	x	-	x
-	-	-	-	-	x	-	Odina Wodier ...	-	-	x	-	-	-
-	-	-	-	-	[x]	[x]	Parishia insignis ...	-	-	x	-	-	-
-	-	-	-	-	x	-	Semecarpus subpanduriformis ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Semecarpus heterophyllus ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Spondias mangifera ...	-	-	x	-	-	-
-	-	-	-	-	x	x	Gracontomelum mangiferum ...	-	-	x	-	-	-

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.					
Westn. Section.			Eastn. Section.					Africa.	S. E. Asia.	Australia.	Polynesia.	America.	
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.							
x	x	x	x	x	x	x	Moringa pterygosperma	...	x	x	[x]	[x]	[x]
x	x	x	x	x	x	x	Connarus gibbosus	...	x	x	[x]	[x]	[x]
x	x	x	x	x	x	x	Crotalaria sericea	...	x	x	x	x	x
x	x	x	x	x	x	x	Desmodium umbellatum	...	x	x	x	x	x
x	x	x	x	x	x	x	Desmodium triquetrum	...	x	x	x	x	x
x	x	x	x	x	x	x	Desmodium laxiflorum	...	x	x	x	x	x
x	x	x	x	x	x	x	Desmodium polycarpum	...	x	x	x	x	x
x	x	x	x	x	x	x	Desmodium triflorum	...	x	x	x	x	x
x	x	x	x	x	x	x	Alysicarpus vaginalis	...	x	x	x	x	x
p	p	p	p	p	x	p	Phaseolus sp. ...	...	x	x	x	x	x
x	x	x	x	x	x	x	Abrus precatorius	...	x	x	x	x	x
x	x	x	x	x	x	x	Abrus pulchellus	...	x	x	x	x	x
x	x	x	x	x	x	x	Erythrina indica	...	[x]	x	x	x	x
x	x	x	x	x	x	x	Mucuna gigantea	...	[x]	x	x	x	x
x	x	x	x	x	x	x	Mucuna pruriens	...	x	x	x	x	x
x	x	x	x	[x]	[x]	x	Pueraria Candollei	...	x	x	x	x	x
x	x	x	x	x	x	x	Pueraria phaseoloides	...	x	x	x	x	x
x	x	x	x	x	x	x	Canavalia obtusifolia	...	x	x	x	x	x
x	x	x	x	x	x	x	Vigna lutea ...	...	x	x	x	x	x
x	x	x	x	x	x	x	Pterocarpus indicus	...	x	x	x	x	x
x	x	x	x	x	x	x	Derris scandens ...	...	x	x	x	x	x
x	x	x	x	x	x	x	Derris sinuata ...	...	x	x	x	x	x
x	x	x	x	x	x	x	Derris uliginosa ...	...	x	x	x	x	x
x	x	x	x	x	x	x	Pongamia glabra	...	[x]	x	x	x	x
x	x	x	x	x	x	x	Sophora tomentosa	...	x	x	x	x	x
x	x	x	x	[x]	x	x	Mezoneuron enneaphyllum	...	x	x	x	x	x
x	x	x	x	x	x	x	Cæsalpinia Bonducella	...	x	x	x	x	x
x	x	x	x	x	x	x	Cæsalpinia Nuga	...	x	x	x	x	x
x	x	x	x	x	x	x	Tamarindus indica	...	x	x	x	x	x
x	x	x	x	[x]	x	x	Cynometra ramiflora	...	x	x	x	x	x
x	x	x	x	x	x	x	Entada scandens	...	x	x	x	x	x
x	x	x	x	x	x	x	Adenanthera pavonina	...	x	x	x	x	x
x	x	x	x	x	x	x	Acacia concinna	...	x	x	x	x	x
x	x	x	x	x	x	x	Acacia pennata ...	...	x	x	x	x	x
x	x	x	x	x	x	x	Albizzia Lebbeck ...	...	x	x	x	x	x
x	x	x	x	x	x	x	Albizzia procera ...	...	x	x	x	x	x
x	x	x	x	x	x	x	Rhizophora mucronata	...	x	x	x	x	x
x	x	x	x	x	x	x	Rhizophora conjugata	...	x	x	x	x	x
x	x	x	x	x	x	x	Ceriops Candolleana	...	x	x	x	x	x
x	x	x	x	x	x	x	Ceriops Roxburghiana	...	x	x	x	x	x
x	x	x	x	x	x	x	Bruguiera gymnorrhiza	...	[x]	x	x	x	x
x	x	x	x	x	x	x	Terminalia Catappa	...	x	x	x	x	x
x	x	x	x	[x]	x	x	Terminalia bialata	...	x	x	x	x	x
x	x	x	x	[x]	x	x	Lumnitzera racemosa	...	x	x	x	x	x
x	x	x	x	[x]	x	x	Illigera Conyzadenia	...	x	x	x	x	x
x	x	x	x	x	x	x	Gyrocarpus Jacquini	...	x	x	x	x	x
x	[x]	x	x	x	x	x	Barringtonia speciosa	...	[x]	x	x	x	x

DISTRIBUTION IN S. E. ASIA.								GENERAL DISTRIBUTION.				
Westn. Section.		Eastn. Section.						NAMES OF SPECIES.				
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.						
								Africa.	S. E. Asia.	Anstralia.	Polynesia.	America.
—	×	—	—	×	×	×	<i>Barringtonia racemosa</i>	...	×	×	—	—
×	×	—	—	×	×	×	<i>Memecylon edule</i>	...	—	×	—	—
×	×	—	×	×	×	×	<i>Pemphis acidula</i> ...	...	×	×	×	—
—	—	—	—	—	×	—	<i>Lagerstroemia hypoleuca</i>	...	—	×	—	—
—	—	—	—	—	[×	—	<i>Lagerstroemia</i> sp.	...	—	×	—	—
—	—	—	—	—	×	×	<i>Modecca cordifolia</i>	...	—	—	—	—
×	×	×	×	×	×	×	<i>Carica Papaya</i> ...	...	×	×	×	—
×	×	×	—	×	×	×	<i>Trichosanthes palmata</i>	...	—	×	×	—
×	×	—	×	×	×	×	<i>Sesuvium Portulacastrum</i>	...	×	×	×	—
—	—	—	—	×	×	×	<i>Stephegyne diversifolia</i>	...	—	×	—	—
—	×	×	—	×	×	×	<i>Mussaenda calycina</i>	...	—	×	—	—
—	—	—	—	—	—	—	<i>Webera Kurzii</i> ...	...	—	×	—	—
—	—	—	—	×	×	×	<i>Randia longiflora</i>	...	—	×	—	—
—	—	—	—	×	×	×	<i>Diplospora singularis</i>	...	—	×	—	—
×	×	—	×	×	×	×	<i>Guettarda speciosa</i>	...	×	×	×	—
—	—	—	—	—	×	×	<i>Ixora grandiflora</i> var.	...	—	—	—	—
—	—	—	—	—	—	—	<i>Kurzeana</i> ...	...	—	×	—	—
—	—	—	—	—	×	—	<i>Ixora brunnescens</i>	...	—	×	—	—
—	—	—	—	×	×	—	<i>Ixora cuneifolia</i> ...	...	—	×	—	—
×	×	×	×	×	×	×	<i>Pavetta indica</i> ...	...	—	×	×	—
×	×	—	—	—	×	×	<i>Morinda citrifolia</i> var.	...	—	—	—	—
—	—	—	—	—	—	—	<i>bracteata</i> ...	...	—	×	—	—
—	—	—	—	×	[×	—	<i>Psychotria adenophylla</i>	...	—	×	—	—
—	—	×	—	×	×	×	<i>Paderia foetida</i> ...	...	—	×	—	—
×	×	×	×	×	×	×	<i>Vernonia cinerea</i>	...	×	×	×	×
×	×	×	×	×	[×	—	<i>Vernonia divergens</i>	...	—	×	—	—
×	×	×	×	×	×	×	<i>Adenostemma viscosum</i>	...	×	×	×	×
×	×	×	×	×	×	×	<i>Ageratum conyzoides</i>	...	×	×	×	×
—	×	—	—	—	[×	—	<i>Blumea virens</i> ...	...	—	×	—	—
—	—	—	×	×	×	×	<i>Pluchea indica</i> ...	...	—	×	—	—
×	×	—	×	×	×	×	<i>Wedelia scandens</i>	...	×	×	×	—
×	×	—	×	×	×	×	<i>Scævola Koenigii</i>	...	—	×	×	—
×	×	×	×	×	×	×	<i>Ardisia humilis</i> ...	...	—	×	—	—
×	×	—	×	×	×	×	<i>Ægiceras majus</i> ...	...	—	×	×	—
—	—	—	—	—	—	—	<i>Mimusops littoralis</i>	...	—	×	—	—
—	—	—	—	—	×	—	<i>Diospyros Kurzii</i>	...	—	×	—	—
×	×	×	—	×	×	×	<i>Rauwolfia serpentina</i>	...	—	×	—	—
×	×	—	×	×	×	×	<i>Cerbera Odollam</i>	...	—	×	×	—
×	×	—	—	×	×	×	<i>Ochrosia borbonica</i>	...	[×	×	—	—
—	—	—	—	—	×	—	<i>Tabernaemontana crispa</i>	...	—	×	—	—
—	×	—	—	[×	—	—	<i>Strophanthus Wallichii</i>	...	—	×	—	—
×	×	—	—	×	×	×	<i>Anodendron paniculatum</i>	...	—	×	—	—
×	×	×	—	×	×	×	<i>Chonemorpha macrophylla</i>	...	—	×	—	—
[×	—	—	—	×	×	×	<i>Sarcobolus globosus</i>	...	—	×	—	—
—	—	—	—	×	×	×	<i>Hoya parasitica</i> ...	...	—	×	—	—
—	—	—	—	×	×	×	<i>Hoya diversifolia</i>	...	—	×	—	—
—	—	—	—	×	×	×	<i>Dischidia nummularia</i>	...	—	×	—	—

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.					
Westn. Sectn.			Eastn. Sectn.					Africa.	S. E. Asia.	Australia.	Polynesia.	America.	
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.							
x	x	x	—	x	x	x	<i>Limnanthemum indicum</i>	...	x	x	x	x	—
x	x	—	—	x	x	x	<i>Cordia subcordata</i>	...	x	x	x	x	—
x	x	—	—	x	x	x	<i>Tournefortia argentea</i>	...	x	x	x	x	—
x	x	x	—	x	x	x	<i>Erycibe paniculata</i>	...	—	x	x	—	—
—	—	—	—	x	x	x	<i>Argyreia tiliaefolia</i>	...	—	x	x	—	—
—	—	—	—	x	x	—	<i>Argyreia Hookeri</i>	...	—	x	—	—	—
—	—	—	—	[x]	[x]	—	<i>Argyreia lanceolata</i>	...	—	x	—	—	—
x	x	—	—	—	x	x	<i>Lettsomia peguensis</i>	...	—	—	—	—	—
x	x	—	—	—	x	x	<i>Ipomæa grandiflora</i>	...	x	x	—	x	—
x	x	x	x	x	x	x	<i>Ipomæa coccinea</i> ...	...	x	x	x	x	x
x	x	—	x	x	x	x	<i>Ipomæa Batatas</i> ...	...	x	x	x	x	x
x	x	—	x	x	x	x	<i>Ipomæa digitata</i> ...	...	x	x	x	x	x
x	—	—	—	x	x	x	<i>Ipomæa denticulata</i>	[x]	x	x	x	—	—
x	x	x	x	x	x	x	<i>Ipomæa Turpethum</i>	...	x	x	x	x	—
x	x	—	—	x	x	x	<i>Ipomæa biloba</i> ...	...	x	x	x	x	x
x	x	—	x	x	x	x	<i>Convolvulus parviflorus</i>	...	—	x	x	—	—
—	—	—	—	[x]	x	—	<i>Porana spectabilis</i>	...	—	x	x	—	—
x	x	x	x	x	x	x	<i>Solanum Melongena</i>	...	x	x	—	x	x
x	x	x	x	x	x	x	<i>Physalis minima</i> ...	...	x	x	x	x	x
x	x	x	x	x	x	x	<i>Capsicum minimum</i>	...	—	x	x	—	—
x	x	x	x	x	x	x	<i>Scoparia dulcis</i> ...	...	x	x	—	x	x
—	—	—	—	x	x	x	<i>Oroxylum indicum</i>	...	—	x	x	—	—
—	—	—	—	x	x	—	<i>Heterophragma adenophyllum</i> ...	...	—	x	—	—	—
—	—	—	—	x	x	x	<i>Thunbergia laurifolia</i>	...	—	x	—	—	—
x	x	x	—	x	x	x	<i>Hygrophila quadrivalvis</i>	...	—	x	—	—	—
x	—	—	—	[x]	[x]	—	<i>Strobilanthes phyllostachyus</i>	...	—	x	—	—	—
—	—	—	—	[x]	x	?	<i>Eranthemum album</i>	...	—	x	—	—	—
x	x	x	x	x	x	x	<i>Eranthemum succifolium</i>	...	—	x	—	—	—
—	—	—	—	—	x	x	<i>Rungia parviflora var. pectinata</i> ...	...	—	x	—	—	—
—	—	—	—	—	x	x	<i>Peristrophe acuminata</i>	...	—	x	x	—	—
x	x	x	x	x	x	x	<i>Lippia nodiflora</i> ...	...	x	x	x	x	x
x	x	—	x	x	x	x	<i>Premna integrifolia</i>	...	—	x	?	?	—
—	—	—	—	—	x	—	<i>Premna</i> sp. (? <i>P. obtusifolia</i>) ...	...	—	x	?	—	—
x	x	x	x	x	x	x	<i>Vitex Negundo</i> ...	...	x	x	—	—	—
x	x	—	—	x	x	x	<i>Vitex pubescens</i> ...	...	—	x	—	—	—
—	—	—	—	—	x	?	<i>Vitex Wimberleyi</i> (? <i>V. Sumatrana</i>)	...	—	x	—	—	—
x	x	—	x	x	x	x	<i>Clerodendron inerme</i>	...	—	x	x	x	—
x	x	—	x	x	x	x	<i>Avicennia officialis</i>	...	x	x	x	—	x
x	x	x	x	x	[x]	x	<i>Anisomeles ovata</i>	...	—	x	—	—	—
x	x	x	x	x	x	x	<i>Boerhaavia repens</i>	...	x	x	x	x	—
x	x	—	x	x	x	x	<i>Pisonia aculeata</i> ...	...	x	x	x	—	x
—	—	—	—	—	x	x	<i>Pisonia excelsa</i>	...	—	x	—	—	—
x	x	x	x	x	x	x	<i>Celosia cristata</i> ...	...	x	x	—	—	x
x	x	x	x	x	x	x	<i>Achyranthes aspera</i>	...	x	x	x	x	x

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.					
Westn. Sectn.			Eastn. Sectn.					Africa.	S. E. Asia.	Australia.	Polynesia.	America.	
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.							
x	x	—	—	x	x	x	<i>Achyranthes aspera</i> var. por- phyristachya ...	—	—	x	—	—	—
x	x	x	x	x	x	x	<i>Gomphrena globosa</i> ...	x	x	x	—	—	x
x	x	x	x	x	x	x	<i>Polygonum barbatum</i> ...	x	x	x	x	—	—
x	x	x	x	x	x	x	<i>Bragantia tomentosa</i> ...	—	—	—	—	—	—
x	x	x	x	x	x	x	<i>Aristolochia tagala</i> ...	—	—	x	—	—	—
x	—	—	—	[x]	x	x	<i>Piper caninum</i> ...	—	—	x	—	—	—
—	—	—	—	—	x	x	<i>Myristica Irya</i> ...	—	—	x	—	—	—
—	—	—	—	—	x	x	<i>Myristica glauca</i> ...	—	—	—	—	—	—
x	x	—	x	x	x	x	<i>Dehaasia Kurzii</i> ...	—	—	—	—	—	—
x	x	x	x	x	x	x	<i>Hernandia peltata</i> ...	[x]	x	x	x	—	—
x	x	x	x	x	x	x	<i>Cassytha filiformis</i> ...	x	x	x	x	x	—
x	x	x	—	—	x	x	<i>Loranthus longiflorus</i> ...	—	—	x	—	—	—
—	—	—	—	[x]	x	x	<i>Champereia Griffithiana</i> ...	—	—	x	—	—	—
x	x	—	x	x	x	x	<i>Euphorbia Atoto</i> ...	—	—	x	x	x	—
x	x	x	x	x	x	x	<i>Euphorbia pilulifera</i> ...	—	x	x	x	x	x
—	—	—	—	—	x	x	<i>Bridelia Kurzii</i> ...	—	—	x	—	—	—
x	x	x	x	x	x	x	<i>Bridelia tomentosa</i> ...	—	—	x	x	—	—
—	—	—	—	[x]	[x]	x	<i>Phyllanthus columnaris</i> ...	—	—	x	—	—	—
x	x	x	x	x	x	x	<i>Flueggia microcarpa</i> ...	—	x	x	x	x	—
—	—	x	—	x	[x]	—	<i>Cyclostemon assamicus</i> ...	—	—	x	—	—	—
—	—	—	—	—	x	—	<i>Aporosa villosula</i> ...	—	—	x	—	—	—
—	—	—	—	[x]	x	—	<i>Croton sublyratus</i> ...	—	—	x	—	—	—
—	—	—	—	—	x	—	<i>Blachia andamanica</i> ...	—	—	x	—	—	—
—	—	—	—	—	x	x	<i>Claoxylon longifolium</i> ...	—	—	x	—	—	—
—	—	—	—	[x]	x	x	<i>Mallotus acuminatus</i> ...	—	—	x	—	—	—
—	—	—	—	—	x	—	<i>Mallotus andamanicus</i> ...	—	—	x	—	—	—
—	—	—	—	—	x	x	<i>Macaranga Tanarius</i> ...	—	—	x	—	—	—
—	—	—	—	x	x	x	<i>Cnesmone javanica</i> ...	—	—	x	—	—	—
x	x	—	—	x	x	x	<i>Phyllochlamys spinosa</i> ...	—	—	x	—	—	—
—	—	—	—	[x]	x	—	<i>Plecosperrum andamanicum</i> ...	—	—	x	—	—	—
—	x	x	—	x	x	x	<i>Ficus Benjamina</i> ...	—	—	—	x	—	—
x	x	x	x	x	x	x	<i>Ficus Rumphii</i> ...	—	—	x	—	—	—
—	—	—	x	x	x	x	<i>Ficus retusa</i> var. <i>nitida</i> ...	—	—	x	x	—	—
—	—	—	—	—	x	x	<i>Ficus brevicuspis</i> ...	—	—	x	—	—	—
x	x	—	—	x	x	x	<i>Ficus callosa</i> ...	—	—	x	—	—	—
x	x	x	x	x	x	x	<i>Ficus hispida</i> ...	—	—	x	x	—	—
—	—	—	—	[x]	[x]	—	<i>Ficus grisea</i> ...	—	—	x	—	—	—
x	x	—	—	x	x	x	<i>Antiaris toxicaria</i> ...	—	—	x	—	—	—
—	—	—	—	—	x	x	<i>Artocarpus Gomeziana</i> ...	—	—	x	—	—	—
—	—	—	—	[x]	x	x	<i>Cycas Rumphii</i> ...	—	—	x	x	—	—
—	—	—	—	x	x	x	<i>Dendrobium secundum</i> ...	—	—	x	—	—	—
x	x	—	—	—	x	x	<i>Calanthe veratrifolia</i> ...	—	—	x	x	—	—
x	x	x	—	x	[x]	—	<i>Dorites Wightii</i> ...	—	—	x	—	—	—
—	x	x	—	[x]	[x]	—	<i>Ærides multiflorum</i> ...	—	—	x	—	—	—
x	x	x	—	—	x	x	<i>Pholidota imbricata</i> ...	—	—	x	—	—	—
x	x	x	x	x	x	x	<i>Costus speciosus</i> ...	—	—	x	—	—	—

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Sectn.			Eastn. Sectn.					Africa.	S. E. Asia.	Australia.	Polynesia.	America.
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.						
x	x	x	x	x	x	x	Zingiber sp. ...	x	x	x	x	x
x	x	x	x	x	x	x	Musa sapientum ...	x	x	x	x	x
x	x	x	x	x	x	x	Crinum asiaticum ...	x	x	x	x	x
x	x	x	x	x	x	x	Tacca pinnatifida ...	x	x	x	x	x
x	x	x	x	x	x	x	Dioscorea glabra ...	x	x	x	x	x
x	x	x	x	x	x	x	Dioscorea pentaphylla	x	x	x	x	x
x	x	x	x	x	x	x	Smilax macrophylla	x	x	x	x	x
x	x	x	x	x	x	x	Asparagus racemosus	x	x	x	x	x
x	x	x	x	x	x	x	Dracæna angustifolia	x	x	x	x	x
x	x	x	x	x	x	x	Dracæna spicata ...	x	x	x	x	x
x	x	x	x	x	x	x	Gloriosa superba ...	x	x	x	x	x
x	x	x	x	x	x	x	Polia zorzogonensis	x	x	x	x	x
x	x	x	x	x	x	x	Commelina obliqua	x	x	x	x	x
x	x	x	x	x	x	x	Aneilema ovatum	x	x	x	x	x
x	x	x	x	x	x	x	Flagellaria indica	x	x	x	x	x
x	x	x	x	x	x	x	Caryota sobolifera	x	x	x	x	x
x	x	x	x	x	x	x	Corypha elata ...	x	x	x	x	x
x	x	x	x	x	x	x	Livistona sp. ...	x	x	x	x	x
x	x	x	x	x	x	x	Calamus tigrinus ...	x	x	x	x	x
x	x	x	x	x	x	x	Calamus andamanicus	x	x	x	x	x
x	x	x	x	x	x	x	Cocos nucifera ...	x	x	x	x	x
x	x	x	x	x	x	x	Pandanus odoratissimus	x	x	x	x	x
x	x	x	x	x	x	x	Amorphophallus sp.	x	x	x	x	x
x	x	x	x	x	x	x	Alocasia fornicata	x	x	x	x	x
x	x	x	x	x	x	x	Scindapsus officinalis	x	x	x	x	x
x	x	x	x	x	x	x	Pothos scandens ...	x	x	x	x	x
x	x	x	x	x	x	x	Cymodocea ciliata	x	x	x	x	x
x	x	x	x	x	x	x	Zanichellia palustris	x	x	x	x	x
x	x	x	x	x	x	x	Cyperus polystachyus	x	x	x	x	x
x	x	x	x	x	x	x	Cyperus elegans ...	x	x	x	x	x
x	x	x	x	x	x	x	Cyperus dilutus ...	x	x	x	x	x
x	x	x	x	x	x	x	Cyperus pennatus	x	x	x	x	x
x	x	x	x	x	x	x	Kyllinga brevifolia	x	x	x	x	x
x	x	x	x	x	x	x	Fimbristylis diphylla	x	x	x	x	x
x	x	x	x	x	x	x	Fimbristylis ferruginea	x	x	x	x	x
x	x	x	x	x	x	x	Fimbristylis quinqueangularis	x	x	x	x	x
x	x	x	x	x	x	x	Fimbristylis miliacea	x	x	x	x	x
x	x	x	x	x	x	x	Scirpus subulatus	x	x	x	x	x
x	x	x	x	x	x	x	Paspalum scrobiculatum	x	x	x	x	x
x	x	x	x	x	x	x	Panicum ciliare ...	x	x	x	x	x
x	x	x	x	x	x	x	Panicum colonum	x	x	x	x	x
x	x	x	x	x	x	x	Panicum Helopus	x	x	x	x	x
x	x	x	x	x	x	x	Panicum javanicum	x	x	x	x	x
x	x	x	x	x	x	x	Panicum Myurus ...	x	x	x	x	x
x	x	x	x	x	x	x	Panicum montanum	x	x	x	x	x
x	x	x	x	x	x	x	Oplismenus compositus	x	x	x	x	x
x	x	x	x	x	x	x	Thuarea sarmentosa	x	x	x	x	x

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Sectn.			Eastn. Sectn.					Africa.	S. E. Asia.	Australia.	Polynesia.	America.
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.						
x	x	x	x	x	x	x	Ischæmum ciliare	...	—	x	x	—
x	x	x	x	x	x	x	Ischæmum muticum	...	—	x	x	—
x	x	x	x	x	x	x	Andropogon contortus	...	x	x	x	x
x	x	x	x	x	x	x	Eleusine indica ...	...	x	x	x	x
x	x	x	x	x	x	x	Eleusine ægyptiaca	...	x	x	x	x
—	—	—	x	—	[x]	—	Dendrocalamus strictus	...	—	x	—	—
—	—	—	—	—	—	—	Davallia solida ...	...	—	x	x	—
x	x	x	x	x	x	x	Adiantum lunulatum	...	x	x	x	x
x	x	x	x	x	x	x	Ceratopteris thalictroides	...	x	x	—	x
x	x	x	x	x	x	x	Polypodium irioides	...	x	x	x	x
x	x	x	x	x	x	x	Polypodium adnascens	...	x	x	x	—
x	x	x	x	x	x	x	Polypodium quercifolium	...	—	x	x	—
x	x	x	x	x	x	x	Vittaria elongata ...	...	x	x	x	—
x	x	x	x	x	x	x	Acrostichum scandens	...	—	x	x	—
x	x	x	x	x	x	x	Acrostichum appendiculatum	...	—	x	—	—
x	x	x	x	x	x	x	Lygodium flexuosum	...	x	x	—	—
x	x	—	—	—	x	x	Chara foetida ...	...	—	x	—	—
x	x	x	—	—	x	x	Calymperes Dozyanum	...	—	x	—	—
x	x	x	x	x	x	x	Bryum coronatum	...	x	x	x	x
—	—	—	—	—	—	—	Lejeunea sp. ...	...	—	x	—	—
x	x	x	x	x	x	x	Collema nigrescens	...	x	x	x	x
x	x	x	x	x	x	x	Physcia obscura ?	...	x	x	x	x
—	—	—	—	—	—	—	Physcia sp. ...	...	—	x	—	—
—	—	—	—	—	—	x	Lepraria sp. ...	...	—	x	—	—
x	x	x	—	x	x	x	Lentinus leucochrous	...	—	x	—	—
x	x	x	—	x	x	x	Lenzites deplanata	...	—	x	—	—
x	x	—	—	—	x	x	Lenzites subferruginea	...	—	x	—	—
—	—	—	—	—	—	—	Polyporus fulvus ...	...	—	x	—	—
x	x	x	x	x	x	x	Polyporus xanthopus	...	x	x	x	x
x	x	x	x	x	x	x	Polyporus sanguineus	...	x	x	x	x
x	x	x	—	—	x	x	Polyporus grammatocephalus	...	—	x	x	x
x	x	x	x	x	x	x	Polyporus australis	...	x	x	x	x
x	—	—	—	—	—	—	Hexagona pergamenea	...	—	x	—	—
—	—	—	—	—	—	[x]	Hexagona sericeo-hirsuta	...	—	x	—	x
—	—	—	—	—	—	—	Hexagona tenuis ...	...	x	x	—	—
—	x	—	—	—	—	—	Dedælea flabellum	...	—	x	—	—
—	x	—	—	—	—	—	Dedælea sanguinea	...	—	x	—	—
x	x	x	—	x	x	x	Dedælea quercina	...	x	x	x	x
x	x	x	—	x	x	x	Dedælea concentrica	...	x	x	x	x
x	x	x	x	x	x	x	Thelephora incrustans	...	x	x	x	x
x	x	x	x	x	x	x	Bovista lilacina ...	...	x	x	x	x
x	x	—	—	x	x	x	Hirneola polytricha	...	x	x	—	x
—	—	—	—	—	[x]	—	Xylaria clavarioides	...	—	x	—	—
—	x	—	—	—	[x]	—	Daldinia vernicosa	...	—	x	—	x
—	—	—	—	—	—	—	Rhytisma sp. ...	...	—	x	—	—
x	x	—	—	x	x	x	Sargassum ilicifolium	...	x	x	—	x
—	—	—	—	—	x	x	Turbinaria ornata	...	—	x	—	—

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.					
Westn. Sectn.			Eastn. Sectn.					Africa.	S. E. Asia.	Australia.	Polynesia.	America.	
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.							
x	x	—	—	x	x	x	<i>Padina pavonia</i> ...	...	x	x	x	x	x
—	—	—	—	—	x	x	<i>Dictyota dichotoma</i> ...	...	x	x	x	x	x
x	x	—	x	x	x	x	<i>Lithothamnion polymorphum</i> ...	...	x	x	x	—	—
x	x	—	—	—	x	x	<i>Acanthophora Thierii</i> ...	...	x	x	x	x	x
—	—	—	—	—	x	x	<i>Jania tenella</i> ...	...	—	x	—	—	—
—	—	—	—	—	x	x	<i>Gracilaria crassa</i> ...	...	—	x	—	—	—
x	—	—	—	—	x	x	<i>Gelidium corneum</i> ...	...	x	x	x	x	x
x	x	—	—	x	x	x	<i>Caulerpa clavifera</i> ...	...	x	x	x	x	x
—	—	—	—	—	x	x	<i>Caulerpa plumaris</i> ...	...	—	x	—	—	—
x	x	—	—	x	x	x	<i>Valonia fastigiata</i> ...	...	x	x	x	—	x
x	x	—	—	x	x	x	<i>Valonia confervoides</i> ...	...	x	x	x	—	—
x	—	—	—	x	x	x	<i>Halimeda Opuntia</i> ...	...	x	x	x	x	x
—	—	—	—	—	x	x	<i>Siphonocladus ? filiformis</i> ...	...	x	x	x	—	—
—	—	—	—	—	[x]	—	<i>Vaucheria</i> sp. ...	...	—	x	—	—	—
x	x	—	—	—	x	x	<i>Calothrix pulvinata</i> ...	...	x	x	x	x	x

Reviewing the general distribution of the flora as given in TABLE VI, we find that of the 358 species, 70 are cosmopolitan in the tropics, 10 more are nearly so, 49 are more or less widely spread throughout the tropics of the old world, 41 extend from South-eastern Asia to Australasia, while 188 species are confined to South-eastern Asia. The sub-joined synoptic table indicates these distributional features more exactly and gives at the same time the relationship of this distribution both to the habit and to the habitat of the species.

TABLE VII. *Relationship of General Distribution to Habit and Habitat.*

HABIT.					DISTRIBUTIONAL FEATURES.	HABITAT.								
Total.	Climbers.	Trees.	Shrubs.	Herbs.		Cultivated sp.	Weeds.	Forest sp.	Marsh.	Littoral.	Marine.	Epiphytic.	Parasitic or	Total.
					<i>Cosmopolitan in the tropics.</i>									
70	14	5	2	49	America, Africa, Asia, Australia, Polynesia	12	16	6	6	12	8	2	8	70
					<i>In tropics of both Hemispheres, but hardly cosmopolitan.</i>									
3	1	1	...	1	America, Africa, Asia, Australia ... ..	...	...	...	...	2	...	...	1	3
2	...	...	...	2	America, Africa, Asia, Polynesia ... ..	...	...	...	...	...	1	...	1	2
3	1	1	...	1	America, Africa, Asia ... ..	...	...	2	...	...	...	...	1	3
2	...	...	...	2	America, Asia ... ..	...	...	...	...	...	...	...	2	2
					<i>Widely distributed in Eastern Hemispheres; not in America.</i>									
29	7	13	4	5	Africa, Asia, Australia, Polynesia ... ..	...	...	2	...	26	...	1	...	29
12	1	3	3	5	Africa, Asia, Australia ... ..	...	...	3	3	5	1	...	...	12
2	...	1	...	1	Africa, Asia, Polynesia ... ..	...	...	...	...	1	...	1	...	2
6	1	1	2	2	Africa, Asia ... ..	...	...	2	1	2	1	...	...	6
					<i>Confined to Asia and Australasia.</i>									
15	2	2	3	8	Asia, Australia, Polynesia ... ..	...	...	...	...	10	1	3	1	15
23	8	7	6	2	Asia, Australia ... ..	...	...	16	...	6	...	1	...	23
3	...	1	...	2	Asia, Polynesia ... ..	...	...	2	...	...	...	1	...	3
188	43	59	23	58	South-Eastern Asia only ... ..	...	3	2	129	4	16	7	12	188
358	78	94	48	138	TOTALS	15	18	162	14	80	19	21	29	358

In discussing the phytogeographic distribution of these species within the province of South-Eastern Asia it is necessary to distinguish between the districts forming the Western section, *viz.*:—the lower Himalayan slopes with the plains at their foot, Peninsular India, and Ceylon—from the Eastern section, which comprises Southern China, Indo-China, Malaya, including the Philippines, New Guinea, and the coasts of Northern or Tropical Australia. Of the 358 species in the Coco Islands, which therefore necessarily all occur in the Eastern section, 252 species, or 70 per cent., are found in the Western section as well. Of the whole number 153 species, or 43 per cent., extend to Australia, whereas only 140, or 39 per cent., are known to occur in South China.

The following tables indicate the distribution of the species so far as these three portions of S. E. Asia are concerned.

TABLE VIII. *Distribution in S. E. Asia of the species extending from the Coco-group to Cis-gangetic India.*

In all three Cis-gangetic districts (<i>Himalaya, India, Ceylon</i>) :—	134
In China, Indo-China, Malaya, Australia	72
In Indo-China, Malaya, Australia	9
In China, Indo-China, Malaya	26
In Indo-China, Malaya	24
In China, Indo-China, <i>Andamans</i>	1
In Indo-China, <i>Andamans</i>	2
In <i>Himalaya</i> and <i>India</i> :—	14
In Indo-China, Malaya, Australia	1
In China, Indo-China, Malaya	1
In Indo-China, Malaya	7
In China, Indo-China, <i>Andamans</i>	1
In Indo-China, <i>Andamans</i>	3
In <i>Andamans</i>	1
In <i>India</i> and <i>Ceylon</i> :—	76
In China, Indo-China, Malaya, Australia	33
In Indo-China, Malaya, Australia	21
In Indo-China, Malaya	15
In Indo-China, <i>Andamans</i>	1
In <i>Andamans</i> , Malaya, Australia	3
In <i>Andamans</i> , Malaya	3
In <i>Himalaya</i> :—	5
In China, Indo-China, Malaya	1
In Indo-China, Malaya	2
In Indo-China, <i>Andamans</i>	2
In <i>India</i> :—	13
In Indo-China, Malaya, Australia	1
In China, Indo-China, Malaya	1
In Indo-China, Malaya	3
In Indo-China, <i>Andamans</i>	3
In <i>Andamans</i> , Malaya, Australia	2
In <i>Andamans</i>	3
In <i>Ceylon</i> :—	10
In Indo-China, Malaya, Australia	1
In Indo, China, Malaya	6
In <i>Andamans</i> , Malaya	2
In <i>Andamans</i>	1
Total number of species extending from the Coco Group to Cis-gangetic India	252

TABLE IX. *Distribution in S. E. Asia of the species extending from the Coco Group to China.*

Extending as far as <i>Australia</i> :—	106
In Indo-China, Malaya, Australia ; <i>Himalaya, India, Ceylon</i>	72
In Indo-China, Malaya, Australia ; <i>India, Ceylon</i>	33
In Indo-China, Malaya, Australia	1
Extending as far as <i>Malaya</i> :—	31
In Indo-China, Malaya ; <i>Himalaya, India, Ceylon</i>	26
In Indo-China, Malaya ; <i>Himalaya, India</i>	1
In Indo-China, Malaya ; <i>Himalaya</i>	1
In Indo-China, Malaya	3

Extending as far as the <i>Andamans</i> only:—	8
In Indo-China, Andamans; <i>Himalaya, India, Ceylon</i>	1
In Indo-China, Andamans; <i>Himalaya, India</i>	1
In Indo-China, Andamans; <i>India</i>	1

Total number of species extending from the Coco Group to China ... 140

TABLE X. *Distribution in S. E. Asia of the species extending from the Coco Group to Australia.*

Extending as far as <i>China</i> :—	106
To Malaya, Indo-China, China; <i>Himalaya, India, Ceylon</i>	72
To Malaya, Indo-China, China; <i>India, Ceylon</i>	33
To Malaya, Indo-China, China	1

Extending as far as <i>Indo-China</i> :—	38
To Malaya, Indo-China; <i>Himalaya, India, Ceylon</i>	9
To Malaya, Indo-China; <i>Himalaya, India</i>	1
To Malaya, Indo-China; <i>India, Ceylon</i>	21
To Malaya, Indo-China; <i>India</i>	1
To Malaya, Indo-China; <i>Ceylon</i>	2
To Malaya, Indo-China	4

Extending as far as the <i>Coco Group (Andamans)</i> only:—	9
To Malaya, Andamans; <i>Ceylon, India</i>	3
To Malaya, Andamans; <i>Ceylon</i>	1
To Malaya, Andamans; <i>India</i>	2
To Malaya, Andamans	3

Total number of species extending from the Coco Group to Australia ... 153

The analysis of these species thus shows that the figures do not indicate any special connection either with China, with India, or with Australia; many of the species in these tables are cosmopolitan or nearly so, and thus possess no special phytogeographical interest. The number of species that extend from India, Ceylon or the Himalaya to the Andamans and no further, is only 23, or $6\frac{1}{2}$ per cent. of the whole flora; this figure, therefore, more nearly represents what may be considered the peculiarly Indian element in the Flora of the Andamans. There are only three species that extend from South China to the Andamans and no further southwards, and as all three are found in India and may as readily be extensions from India to China as from China to India we may assert that there is no distinctive Chinese feature in the flora at all. Only 9 species extend upwards from Australia as far as the Andamans, but not as far as Indo-China; but all these are characteristic Malayan species and may just as well be considered extensions from Malaya to Australia as from Australia through Malaya to the Coco Islands. The occurrence of as many as 10 of the species in Ceylon and not in India would seem at first to indicate that there is some foundation for a remark by Mr. Kurz, already alluded to in connection with the vegetation of Diamond Island (*J. A. S. B.* lix, pt. 2, p. 290), concerning the presence of a Ceylon

element in the Andamans flora. But a consideration of that section of TABLE VIII in which they are detailed shows that they afford little corroboration of this hypothesis for there is only one species (*Dedœlea flabellum*) restricted to the Andamans and Ceylon, and as this is a *Cryptogam*, too great a reliance ought not to be placed on the fact; Indian *Cryptogams*, other than ferns, have not as yet been assiduously collected and the occurrence here of this Ceylon species perhaps indicates rather a wide dispersion for it than any peculiar affinity of the flora of the group with that of Ceylon.

The general conclusion to which we are led by the evidence these tables afford is, that the flora of the Coco Group is almost purely Transgangeitic, and that while this is the case there is no appreciable Chinese or Australian element present. We have still to ascertain whether it is an Indo-Chinese or a Malayan element that prevails in the flora, and to what extent any independent element exists.

From their geographical position we have to look upon the Coco Islands as part of the Andaman Group: in one sense therefore all the Coco Island species are Andamanese. But there are as many as 30 of the species in the list,* or about 8 per cent. of the flora, whose presence in the Andamans is due only to their having been found in the Coco Group. At the same time, however, it must be remembered that 19 species, or over 5 per cent. of the flora, are peculiar to the Andamans as a whole, not occurring either in Indo-China or in Malaya, while 24 more are only known as Indo-Chinese from their presence in Tenasserim.† Of these 24 Andamans-Tenasserim species, 22, or 6 per cent. of the flora, are confined to these two districts, only two of them extending even as far as the Malay Peninsula. The bearing of this peculiar distribution in the Andamans and in Tenasserim, but neither northward to Indo-China nor southward to Malaya, the writer has already had occasion to note;‡ it will be referred to again below in connection with the probable origin of the Coco Island flora. Another circumstance that must be borne in mind is that as yet very little is known of the flora of North Andaman, and it is not improbable that some of the 30 *Non-Andaman* Coco species will yet be found to occur in that island.§

* Indicated in the list of distribution by [] brackets in the Andamans column.

† Indicated by [] brackets in the Indo-Chinese column.

‡ *Ann. Roy. Bot. Garden*, vol. iii, p. 238.

§ As an example of this possibility may be instanced *Dendrocalamus Strictus* which does not occur in South Andaman. Mr. Godwin-Austen, formerly of Port Blair, one of the very few officers who have ascended Saddle Peak, the highest point of North Andaman, has informed the writer that at one point in the ascent a Bamboo is met with quite different from the Bamboos near Port Blair; not very

Of the 358 species, 232, making 65 per cent. of the whole, occur at once in Indo-China, Malaya and the Andamans; 40 occur in Malaya and the Andamans, 8 of these extending to Tenasserim but not occurring in Burma or Siam (Indo-China proper); 22 occur in Indo-China but not in Malaya, 12 of them being present in the Andamans also; 40 occur in the Andamans without appearing either in Indo-China or in Malaya, though 8 of these appear in Tenasserim, which connects Indo-China with the Malay Peninsula, just as the Andamans connect Indo-China with the Malay Archipelago; 8 occur only in the Coco Islands and Tenasserim, and 13 are apparently confined to the Coco group. This last number is probably too high; some of these species, as well as some of those others for which the Coco locality is as yet the only record from the Andamans, may occur in North Andaman.

The following table gives the distribution of the species in these three districts as well as in the sub-district of Tenasserim:—

TABLE XII. *Distribution of Coco Island species in the Indo-Chinese and Malayan districts.*

A.

Species extending from Coco Group to:—

Indo-China, Tenasserim, Andamans, Malaya, ...	...	232
Indo-China, Tenasserim, ———, Malaya, ...	...	2
————, Tenasserim, Andamans, Malaya, ...	...	8
————, Tenasserim, ———, Malaya, ...	...	1
————, ———, Andamans, Malaya, ...	...	32
Indo-China, ———, Andamans, ———, ...	...	12
————, Tenasserim, Andamans, ———, ...	...	8
Indo-China, ———, ———, ———, ...	...	10
————, Tenasserim, ———, ———, ...	...	8
————, ———, Andamans, ———, ...	...	32

Total species extending from Coco Group	...	345
Species confined to Coco Group	...	13

Total Coco Island species	...	358
---------------------------	-----	-----

				No. of species.	percentage of flora.
B.					
Species occurring in:—					
Indo-China	...	...	...	256	71
Tenasserim	...	...	...	259	72
Andamans	...	...	...	324	90
Malaya	...	...	...	275	76
Species confined to Coco Group	...	...	...	13	3½

This table therefore leads to the conclusion that phyteographically

tall, but extremely hard and tough, and forming dense thickets very difficult to pass through—a general description agreeing very well with that of *Dendrocalamus strictus* as it occurs in Great Coco.

as well as physiographically the Coco Group forms an integral part of the Andamans. Further, it shows that of the possibly predominating elements in their flora, the Indo-Chinese element, as a whole, is slightly weaker even in that part of the Andamans nearest to Burma than is an element indicating a Tenasserim influence and an element indicating a Malayan influence. This seems strange when we recollect that not only do the Cocos form that part of the Andamans nearest to Burma but that there is a shallow ridge, at times raised into islands, along the line between the Cocos and the nearest point on the Burmese mainland, whereas Tenasserim is at the opposite side of a deep sea, while Malaya is separated from the opposite extremity of the Andaman group by a much greater distance and by much deeper straits than Burma is from the area under discussion.

In order, if possible, to account for this peculiarity of distribution, it becomes necessary to discuss the probable origin of the flora of the group.

The first step in such an inquiry is to ascertain the species in a flora that *may* possibly have been introduced and that do not therefore *necessarily* postulate for an isolated locality such as the Cocos any former connection with neighbouring land. It is, of course, evident that if a previous land connection be shewn to be necessary to explain the presence of *any* species in the islands this same land connection would sufficiently explain the presence of most of the species that occur there without requiring the suggestion of any extraneous means of introduction. But until all the possibilities of introduction by means of physical agencies now at work under existing physiographical conditions are completely exhausted, we are not at liberty to assume the existence of dissimilar physiographical conditions or a different application of the present physical agencies.

There is, however, always great difficulty in deciding absolutely what species are indigenous and what species are introduced in any locality, and here no species will be considered "indigenous" for which it is possible to suggest in the remotest fashion any means of introduction. At the risk therefore of including among introduced species many that are probably quite entitled to be termed indigenous, the possibilities are discussed under the headings of the various active introducing agencies. As this involves a use of the terms "indigenous" and "introduced" somewhat different from the sense in which they are generally accepted, it seems better that the possibly introduced species be spoken of as "migrant"; and the certainly indigenous residuary species termed "remanent," many of the "migrant" species being doubtless perfectly "indigenous" in the generally received sense.

Even within the group of "migrant" species difficulties often arise owing to certain species being assisted in one way from island to island

over intervening seas and in another way along continuous land. As an example may be mentioned *Gyrocarpus Jacquinii*, whose progress from island to island is clearly a sea-assisted process, yet whose dispersal inland when it is once established is greatly aided by wind because of its curious dipteroid fruit. It might even be suggested that the wings of this fruit may be sufficient to account for its transmission across intervening seas; but no one who has carefully observed the fall of its fruits is likely to consider this possible. Another very pertinent instance is *Terminalia Catappa*, a species distributed by ocean currents over all the coasts of the Andaman Sea, but which nevertheless occurs far inland as well as on the beaches. The explanation of its inland dispersal is extremely simple, for rats and frugivorous bats are extremely fond of the fleshy part of its fruits while they leave uninjured the stone and kernel. Both these animals are apt when disturbed while eating to carry off in their mouths the fruit they may be devouring, ultimately dropping it some distance from the place where the parent tree grew. But though bats occur in far off lonely islands like Batti Malv and Barren Island, and though their presence there indicates the possibility that animals of the kind may, like fruit-eating birds, carry undigested seeds from one island to another, it is clear, since they do not swallow the stones of *Terminalia Catappa* that they are not to be held responsible for the passage of that species across intervening seas. The farther spread of these species within new localities by agencies quite distinct from that necessary to account for their initial appearance is, it will be admitted, amply demonstrated.* Other examples are *Pisonia aculeata* and *excelsa* which are perhaps introduced by the sea along these coasts. If they are, however, it is quite certain that their presence inland may be amply accounted for owing to their sticky fruits having become attached to birds or animals that have come in contact with them.†

* Residents in India are familiar with the treatment of "country-almonds" by the large "flying-foxes;" fruits carried off by them, and with a portion bitten out of the fleshy side, may be constantly found dropped at considerable distances from the trees on which the almonds grew. In Barren Island there is no doubt that the frugivorous bats which exist there are partly responsible for the same thing, and the writer had an opportunity of witnessing the rats, which abound on that island, engaged in the same act, these creatures having come down to the shore for the fruits that are common there and when disturbed scampering off up gullies with fruits in their mouths.

† A striking instance of the possibility of their becoming attached to the bodies of passing animals was witnessed by the writer on a path between Rangachang and Ali Musjid in South Andaman in April 1891. Though some miles from the sea a considerable number of *Pisonia excelsa* trees occurred at the place, and the path was strewn with their fruits. A tree-snake was seen which had become entangled in a fallen panicle of these so that all escape was impossible, its every movement in-

And in addition to these instances it may be remarked that the whole group of species which may possibly have been introduced in the crops of grain-eating birds can be only considered as indirectly bird-introduced, since some accident must have happened to account for the death of the introducing bird in order to explain the germination of the seed and final introduction of the plant.

The "migrant" species, meaning thereby all that have certainly been introduced and all for which introduction is conceivable, may be divided into "civilized" species introduced by man, and "sylvestrian" or wild species. The wild species may be divided into "coast" species, further subdivided into "marine" and "littoral" species, the whole of the coast species being sea-introduced; and into "inland" species. These latter, which may of course also occur on the shore, but for the introduction of which the sea has not been responsible, may best be classed as "wind-introduced" and as "bird-introduced" species. Species introduced by birds may have been introduced either attached to the bodies of these or carried in their crops. These different groups will be discussed in detail; last of all the "remanent" species will be considered.

The "civilized" species comprise cultivated plants and weeds of cultivation or of waste places; the former corresponding practically to domestic animals like the cow or horse, and to domestic insects like the bee or silk-worm, the latter to the vermin that associate themselves with, or accompany man and his domestic creatures. This group therefore contains the species that may, directly as economic or æsthetic plants, or indirectly as weeds, have been introduced by man. The list subjoined includes the whole of the species present in the islands that are known to be sometimes thus introduced; those that are likely to be here indigenous, or to have been introduced by other than human agency, are enclosed within brackets and will be found again in one or, at times, more than one of the subsequent lists.

List of Civilized species found in the Coco Group.

* *Nymphæa rubra.*

This variety has perhaps been introduced intentionally into Great Coco, where it occurs in the small lake. It has to be recollected that it is a favourite flower with the Burmese and is sold for votive purposes in the Pagodas

volving it more hopelessly in the tangled sticky mass. After the snake died its body was carefully examined and it was found that it had suffered no previous physical injury which could account for its inability to escape.

- about Rangoon; also that the settlement was attempted by a Rangoon gentleman whose servants were, at least partly, Burmese. But typical white *Nymphaea Lotus* occurs in Little Coco, clearly independently of human agency.
- Sida carpinifolia.*
[*Urena lobata.*
- Table Island (the older clearing) only. As a rule this species would, without hesitation, be dealt with as a weed; in Great Coco, however, it does not occur in the clearing and it was not found on Table Island at all. If introduced here, we may safely say that human agency is not responsible for its appearance; more probably it has been introduced by the agency of birds].
- * *Hibiscus Sabdariffa* Great Coco; in the old garden and evidently struggling against extinction.
5. * *Hibiscus Abelmoschus.* Table Island only; but common in many parts of the clearing.
- * *Moringa pterygosperma.* Great Coco; a few trees evidently planted; these are very healthy, and seedlings are already springing up under the adjacent Coco-nut trees.
- * *Crotalaria sericea.* Table Island only; but very abundant; the species may have been unintentionally introduced, but more probably has been brought by the servants at the light-house, who are Burmans and with whom the flower is a favourite.
- * *Desmodium triflorum.* Table Island only; common however on all the grassy slopes.
- * *Alysicarpus vaginalis.* Great Coco; not seen on Table Island, though it probably occurs there.
10. * *Phaseolus* sp. Seedlings in cow-dung on one grassy slope at south-west corner of island. These were seen in 1890; no species was seen in 1889 likely to have given origin to these and there is no indigenous species to which it seems likely they could belong. Unfortunately

neither clearing could be revisited in 1890 to enable the writer to make further investigation.

* *Tamarindus indica*.

Great Coco; only one tree and that, though almost certainly introduced by man probably unintentionally so.

* *Carica Papaya*.

Great Coco; perfectly naturalised and very profuse in the Coco-nut zone, especially in the north end of the island.

[*Vernonia cinerea*.

Both islands; extremely abundant in the clearings, but also plentiful on grassy slopes and bare rocky headlands of the western coast of Great Coco; it also occurs on Rutland Island, at the opposite extremity of the Andaman group, where introduction by man is hardly conceivable: here probably it owes its presence to the agency of wind.]

[*Adenostemma viscosum*.

Great Coco; common on bare rocky promontories on west side and at north end of island. If introduced here it has been introduced independently of human agency; it is probably a sea-introduced species, but perhaps its fruits *may* have come attached to the feathers of birds.]

15. * *Ageratum conyzoides*.

Table Island; common in the clearing; not present in Great Coco.

* *Ipomæa coccinea*.

Table Island; a garden escape, but very plentiful on the edges of jungle-paths far from the lighthouse garden.

* *Ipomæa Batatas*.

Table Island; cultivated only: has not survived on Great Coco, probably owing to the presence of wild pigs. These the writer did not see on Great Coco but their traces were abundant on Table Island and the pigs themselves were obtained on Little Coco. Moreover, Mr. Hume (*Stray Feathers*, ii, p. 111) actually met with them on Great Coco. During our visits 5 or 6 abandoned pariah dogs were seen

- on the island ; but, though these must necessarily have rendered the pigs shy, it can hardly be supposed that they have exterminated them.
- * *Solanum Melongena*. Table Island ; cultivated. Great Coco ; in the old garden and also plentiful all over the clearing ; apparently quite naturalised.
- * *Capsicum minimum*. Table Island ; cultivated, and as an escape. Great Coco ; very plentiful and spreading far into the jungle.
20. * *Scoparia dulcis*. Both islands ; common in the clearings.
- * *Rungia pectinata*. Table Island ; only in the clearing ; not plentiful and as it is not met with in Great Coco is probably here, as it often is, an introduced weed. But it need not always be so since the species is abundant on bare rocky promontories at the south end of Rutland Island where introduction by human agency is not to be thought of.
- [*Anisomeles ovata*. Great Coco ; this species is not present on Table Island apparently, and on Great Coco it was only found on the isthmus connecting the north-eastern peninsula—where the clearing is—with the main island. But the species does not occur *in* the clearing, and it is remarkably abundant where it occurs. Moreover it is exceedingly abundant in Diamond Island, off the Arracan Coast, which is another section of the same island chain ; the writer is therefore inclined to believe that the species does not owe its introduction to human agency but that it may be classed among the remanent species.]
- [*Boerhaavia repens*. In all three islands, common on rocky promontories and bare isolated rocks though a frequent weed of cultivation this owes its presence here, not to human influence, but to the agency of

the sea or to that of littoral birds, such as the Bitterns and Terns that frequent the reefs and rocks, its sticky fruits probably attaching themselves to the feet of these.]

* *Celosia cristata*.

Table Island, a common escape.

25. * *Achyranthes aspera*.

Both islands, common in the clearings and undoubtedly introduced by man. But on Little Coco, the very distinct var. *porphyristachya* is abundant as a climber in the *Pandanus* sea-fence and is probably, like the same variety in the Nicobars, Laccadives, etc., a plant introduced by the sea.

* *Gomphrena globosa*.

Table Island, an abundant escape.

* *Euphorbia pilulifera*.

Table Island, a weed in the clearing, still rare.

* *Musa sapientum*.

There is a Plantain-garden attached to the lighthouse on Table Island. No Plantains are left on Great Coco, doubtless owing to the cattle. These animals eat not only coco-nut leaves but also the leaves of *Pandanus odoratissimus*, so that one is surprised to find that they have left anything in the garden at all. Except for the cattle (and perhaps the pigs, which might grout up the stocks) there is no reason why the Plantain should not thrive if left to itself. In Narcondam there is a grove of Plantains, introduced (by Col. Tytler?), in excellent health.

* *Cocos nucifera*.

Common in all three islands but deserving neither to be deemed indigenous nor to be considered a species introduced by the sea. The question whether its presence is due to some old attempt at settlement or to the shipwreck of some coco-nut laden craft is discussed more fully below.

30. * *Kyllinga brevifolia*.

Both islands, only in the clearings.

* *Fimbristylis diphylla*.

Both islands, only in the clearings.

- | | |
|---|--|
| <p>* <i>Panicum ciliare</i>.</p> <p><i>Panicum colonum</i>.</p> <p>* <i>Panicum Helopus</i>.</p> <p>35. * <i>Eleusine indica</i>.</p> <p>* <i>Eleusine ægyptiaca</i>.</p> | <p>Great Coco ; near south end of island beside some shelter huts used by coco-nut collectors.</p> <p>Both islands, in the clearings and also at south end of Great Coco near the shelter huts.</p> <p>Table Island, in the clearing.</p> <p>Table Island, clearing, common ; Great Coco, rare in the clearing, also a few tufts among droppings of cattle on a bare hill at south-west corner of the island.</p> <p>Table Island ; lighthouse clearing, still rare. [All the <i>Cyperaceæ</i> and <i>Gramineæ</i> may have been introduced by birds.]</p> |
|---|--|

Of the above, nineteen are species which are, or may be, cultivated for economic or æsthetic reasons—the economic plants being *Hibiscus Sabdariffa* (the Rozelle), *Hibiscus Abelmoschus* (the Musk-mallow), *Moringa pterygosperma* (the Horse-Radish tree), *Phaseolus* sp., *Tamarindus indica* (the Tamarind), *Carica Papaya* (the Papaw), *Ipomœa Batatas* (the Sweet-Potato), *Solanum Melongena* (the Bringal), *Capsicum minimum* (the Bird's-Eye Chillee), *Musa sapientum* (the Plantain), *Cocos nucifera* (the Coco-nut), *Panicum ciliare*, *colonum* and *Helopus* (three wild fodder-milletts). Ten of these have undoubtedly been intentionally introduced—one (the Tamarind) certainly has not, and the three fodder grasses may have come as weeds, or equally probably, may have been introduced by grain-eating birds. The æsthetic plants are *Nymphœa rubra*, *Crotalaria sericea*, *Ipomœa coccinea*, *Celosia cristata*, and *Gomphrena globosa*. *Crotalaria sericea* may have been involuntarily introduced, the others almost certainly have been brought intentionally. The other seventeen are, or may be, weeds, but there is every probability that five of them, *Urena lobata*, *Vernonia cinerea*, *Adenostemma viscosum*, *Anisomeles ovata*, and *Boerhaavia repens* do not owe their presence here to human agency.

Of the introduced economic species three are evidently unfitted to survive under the conditions to which, when abandoned, they are exposed. The Rozelle succumbs to climatic influences, the Sweet-Potato and the Plantain are destroyed by animals. On the other hand the propagation of two of these species—the Papaya and the Bird's-Eye Chillee—is remarkable both for its extent and rapidity, and for the fact that the flavour and pungency of the fruit of these species remains undiminished.

The Coco-nut tree deserves to be specially noticed. It is not known where *Cocos nucifera* is "indigenous" and the suggestion that it is "really wild" on the Coco Islands and along the north-western coast of North Andaman, made by the late Mr. Kurz, (*Forest Flora of British Burma* ii, 540), though true enough so far as the Coco Islands are concerned, is denied, as regards North Andaman, by those officers at Port Blair who have had opportunities of investigating the shores of the group. Mr. Kurz did not himself visit either the Coco group or North Andaman, and unfortunately he does not give any authority for the latter part of his statement. But, granting its correctness, the fact remains that about Port Blair the tree only occurs as a recent introduction and it is not met with elsewhere either in South or Middle Andaman, except as a few young trees that have, on Rutland Island, the Sentinels, etc., been deliberately planted. More recently the writer has been told of a bay in one of the islands of the "Archipelago," near Port Blair, which is lined with Coco-nut trees, the result of the wreck of a particular craft that was lost on her way from the Nicobars to a Burmese port; this statement the writer has not yet been able personally to verify. In Narcondam there are Coco-nut trees in no fewer than three places, and as there is absolutely nothing to disturb them there, they are spreading rapidly. In Barren Island also there is one bay where a considerable number of Coco-nut trees grow and where also the species is rapidly spreading. But in both these islands the introduction has been deliberate and quite recent; this in Narcondam is particularly evident from the fact that the oldest trees occur along with a grove of Plantains, though it is equally apparent that the spread of the species to one, and probably to both, of the two other bays where it occurs, has been unassisted by man and is due to fallen nuts having been drifted round from the first planted trees. It is, however, very remarkable that *Cocos nucifera* should be so abundant in the Coco group and be absent from, or very rare in, the Andamans proper, including Little Andaman, and that the species should again occur in such abundance in the Nicobars. The direction of the ocean currents has been suggested as possibly explaining the fact, but with very unsatisfactory results, because, whatever be the theoretical direction assumed for these currents in order to explain the distribution of *Cocos nucifera*, it must fail to coincide with the direction postulated to explain the distribution of *Casuarina equisetifolia*, a tree which is extremely common in the Nicobars and is so plentiful in Little Andaman, where there are no Coco-nuts, that the English equivalent for the Andamanese name of the island is "Casuarina-sand," the name taking its origin from the great prevalence of this species on all its beaches. But though there are no Coco-nut trees in the Andaman group

proper, there is one place where *Casuarina equisetifolia* occurs. This is a small bay, Casuarina Bay, on the west coast of North Andaman, on the beach of which the species is plentiful. In the Coco group, where there are Coco-nut trees, there is no *Casuarina equisetifolia* though it occurs again in Arracan and Chittagong where there are no Coco-nuts. As a matter of fact there is a steady current northward along the west coast of the Andamans for a considerable period of the year and it is difficult to understand why both *Cocos* and *Casuarina* do not occur plentifully along the whole west coast of the Andaman chain. The writer's examination of the ocean-drifts of the Coco group during his two visits did not throw much light on the subject. Wreckage in considerable quantity is to be found along the whole of the coasts, in most cases, however, belonging to wrecks that have occurred on the spot; the disposition of the fragments therefore only throws light on the "set" of local currents. Among the exceptions to this were a dressed teak-log on the east side of Great Coco, a padouk-log on the east side of Jerry Island, a quantity of Burmese sea-fishing-gear on the eyot between Great Coco and Jerry, fragments of two different Andamanese canoes on the east coast of Great Coco, a clump with roots of a very large Bamboo (not improbably *Bambusa gigantea*) on the west side of Great Coco, part of a third Andamanese canoe on the east side of the Little Coco, and a fruit, with part of stalk, of *Nipa fruticans* at the south end of Little Coco. Except the Andamanese canoes the whole of these objects indicated a "set" of ocean-current from Burma, for though *Nipa fruticans* which, strangely, appears to be absent from the Cocos, is both a Burmese and an Andamans species, this particular fruit had its stalk cut cleanly off by some sharp implement, and if it came from the Andamans it must therefore have floated from the neighbourhood of the settlement at Port Blair, a sufficiently improbable circumstance, as the examination of a map of the Andaman sea will show. Now if the set of the currents is such as to bring "drift" from Burma, and if these currents have brought the Coco-nut tree originally to the islands, we must explain how it happens that the islands of the "Archipelago" near port Blair, on the shores of which an undoubtedly Burmese "drift", in the shape of teak-logs, etc., is very plentiful, do not have Coco-nut trees on all their coasts. It has been suggested that the ocean-currents have thrown up Coco-nuts on the shores of the Andamans as well as on those of the Cocos, but that owing to the presence of the aboriginal inhabitants, always on the outlook for what they may pick up on the shore, the establishment of the species in the larger group has been impossible because any nut thrown up is found by them and immediately eaten or destroyed. This suggestion the writer owes to Mr. M. V. Portman of

Port Blair; it remains nevertheless difficult to understand why not a single Coco-nut should have escaped the notice of the Andamanese—who after all are not a numerous race—while, as it happens, we have Mr. Kurz's positive statement that in certain parts of North Andaman the species does occur.

It seems to the writer that for this particular group of islands, although the spread of the Coco-nuts *within* the group is undoubtedly due to the agency of the sea, the ocean-current theory does not explain the presence of the species, and that the original introduction has more probably been due to human interference. The question remains whether this was voluntary or involuntary. It may have been the result of an attempt at settlement in the island. The most recent attempt, which dates from 1878, is not the only one on record. An earlier attempt, as unsuccessful as the last, was made in 1849. But it does not follow, though these are the only attempts known, that they are the only ones which have been made. Both were made entirely on account of the Coco-nut being present in the islands, as perhaps other attempts before them may have been, for it appears that the name Coco Islands, implying the establishment there of *Coco nucifera* and the knowledge of that fact by navigators, dates from some of the very earliest European visits to Eastern seas. But it is not impossible that a yet earlier attempt to settle here may have been made and that the introduction of the Coco-nut may have been one of its results. It is easy to understand that these islands should have been chosen in preference to the more inviting-looking Andaman group owing to the character for ferocity which, for some curious reason, was attributed to the inhabitants of the Andamans by early navigators, and it is as easy to understand that the adverse natural conditions which prevail, and which have caused the failure of all recent attempts at settlement, must soon have led to the abandonment of the earliest attempt. The writer feels inclined to think that this may be the true explanation of the presence of *Coco nucifera* in the Cocos Islands. But it may quite as readily have been due to involuntary introduction by ship-wreck; for while disinclined to accept the suggestion that there are no Coco-nut trees in the Andamans because the Andamanese have eaten all the stranded Coco-nuts, when it is applied to nuts thrown up by ocean-currents, the writer thinks this explanation may well enough account for the presence of Coco-nut trees in the Cocos while they are absent from the main islands, if introduction by reason of ship-wreck is postulated. In the Cocos there are no inhabitants, while in the main islands there are; and though it is scarcely reasonable to suppose that the Andamanese would detect every nut that is cast up on the beach, there is little doubt that they would soon become aware of the

wreck of a Coco-nut craft and, becoming aware of it, there is as little doubt that they would soon consume every Coco-nut the vessel contained.

Now that the Coco-nut tree is established in the islands, it germinates profusely. Even towards the centre of the island on flat or muddy tracts one meets with groves, containing from a score to several hundreds of trees, that have originated from nuts which have been floated inland by unusually high tides and left stranded far from the coast. The stems of these inland examples are abnormally tall, shooting up till the leafy head rises above the surrounding jungle; as far as can be seen, they do not flower till this happens. Once they have flowered and fruited the fallen nuts multiply the species fifty-fold. The nut appears to have but few enemies, and though a good many may be seen with a hole drilled through the husk and with the kernel scooped out, (apparently both crabs and rats are able to effect this,) the number thus destroyed forms quite an inappreciable proportion of the whole. The tree does not, however, invade the ridges, the soil is doubtless, as it is in South Andaman, too poor to suit it; while in trees growing along the bays on the west side of Great Coco the contents of the nut are distinctly less and their quality is appreciably poorer than in trees at the head of the bays on the opposite side; these in turn produce nuts that do not bear comparison with the magnificent examples grown in the Nicobars.

In the subjoined table the distribution of the "civilized" species is given; in those cases where the species is believed to be truly indigenous in a particular area the distribution mark indicating the area in question is enclosed within () brackets. From this table we learn that 28 of these species, or 80 per cent. of the whole, are cosmopolitan in the tropics, and that, with the exception of one weed and two cultivated species, which do not occur in the Orient, they are sub-tropical as well as tropical species. The original home of about one-half of the species is known with some degree of certainty and it is interesting to note that 7, or 20 per cent. of the class, are originally natives of the New World, introduced in consequence of human intercourse into, and now established in, the Eastern Hemisphere as well. Ten of them are known to be natives of South-Eastern Asia; only six of these have spread beyond that area.

TABLE XII. *Distribution of "Civilized" species present in the Coco Group.*

Cultivated species.	Weeds.	SPECIES.	Africa.	Orient.	S. E. Asia.	Australia.	Polynesia.	America.
1	—	Nymphæa rubra ...	×	×	×	—	—	—
—	1	Sida carpinifolia ...	×	×	×	×	×	×
—	1	[Urena lobata] ...	×	—	×	×	×	×
1	—	Hibiscus Sabdariffa ...	×	×	(x)	×	×	×
1	—	Hibiscus Abelmoschus ...	×	×	(x)	×	×	×
1	—	Moringa pterygosperma ...	×	×	(x)	×	×	×
1	—	Crotalaria sericea ...	—	—	(x)	—	—	—
—	1	Desmodium triflorum ...	×	×	×	×	×	×
—	1	Alysicarpus vaginalis ...	×	×	(x)	×	×	×
1	—	Phaseolus sp. ...	—	p	—	p	p	p
1	—	Tamarindus indica ...	(x)	×	×	×	×	×
1	—	Carica Papaya ...	×	×	×	×	×	(x)
—	1	Vernonia cinerea ...	×	×	×	×	×	×
—	1	Adenostemma viscosum ...	×	×	×	×	×	×
—	1	Ageratum conyzoides ...	×	×	×	×	×	(x)
1	—	Ipomœa coccinea ...	×	×	×	×	×	(x)
1	—	Ipomœa Batatas ...	×	×	×	×	×	(x)
1	—	Solanum Melongena ...	×	×	(x)	×	×	×
1	—	Capsicum minimum ...	—	—	(x)	—	—	—
—	1	Scoparia dulcis ...	×	×	×	×	×	(x)
—	1	Rungia pectinata ...	—	—	(x)	—	—	—
—	1	[Anisomeles ovata] ...	—	—	(x)	—	—	—
—	1	[Boerhaavia repens] ...	×	×	×	×	×	—
1	—	Celosia cristata ...	×	×	×	—	—	×
—	1	Achyranthes aspera ...	×	×	×	×	×	×
1	—	Gomphrena globosa ...	×	×	×	×	×	(x)
—	1	Euphorbia pilulifera ...	×	×	×	×	×	×
1	—	Musa sapientum ...	×	—	(x)	×	×	×
1	—	Cocos nucifera ...	×	—	×	×	×	(x)
—	1	Kyllinga brevifolia ...	×	×	×	×	×	×
—	1	Fimbristylis diphylla ...	×	×	×	×	×	×
1	—	[Panicum colonum] ...	×	×	×	×	×	×
—	1	Panicum ciliare ...	×	×	×	×	×	×
1	—	[Panicum Helopus] ...	×	×	×	×	—	—
—	1	Eleusine indica ...	×	×	×	×	×	×
—	1	Eleusine ægyptiaca ...	×	×	×	×	×	×

The only *Cryptogam* that belongs to this class is the incompletely known *Fungus* the mycelium of which has proved so destructive to the tea-crop at Port Blair. From what has been said in the account of this species it will be seen that the species, whatever it may be, is certainly indigenous in, or at any rate has not been introduced by human agency into, the Andaman group.

We have now to consider the "sylvestrian", or truly wild, "migrant" species. These may be conveniently subdivided into "coast" and "inland" species—the former a group the members of which may, and here in most instances probably do, owe their presence

to introduction by means of ocean-currents. But just as we have seen that some of the weeds may be claimed as indigenous, or at all events as introduced by other than human agency, so here we find that these classes pass insensibly into each other and that species which may be introduced by the sea, such as *Entada scandens*, *Gloriosa superba*, *Boerhaavia repens*, *Cocos nucifera*, etc., may quite as reasonably owe their presence to a previous land-connection, to wind, to birds, or to involuntary or voluntary human agency. The more doubtful instances, however, will be found discussed in detail below. This group of species, however, as a whole, is characterised by a general distribution which is directly affected by the physiographical features of, and the currents that prevail in, the surrounding seas, and is only indirectly, if at all, influenced by the configuration of the adjacent land.

The "coast" species have to be further subdivided in "marine" and "littoral" species, and the former group, as comprising the plants for which the influence of ocean-currents is most evident, will be considered first. Only one *Phanerogam* belongs to this class; this species, *Cymodocea ciliata*, is however almost the most plentiful, the only other common species being *Sargassum ilicifolium*; all the others are very inconspicuous, being few in number, small in size, and scantily represented.

The following table gives at once a list of, and indicates the marine distribution for, these species; for six of them, as the general list shews, this is, as regards the *Algae*, only approximate.

TABLE XIII. *Distribution of the "Marine" species present in the Coco Group.*

SPECIES.	Atlantic.			SPECIES.	Atlantic.		
	Indian Ocean.	Pacific.			Indian Ocean.	Pacific.	
<i>Cymodocea ciliata</i> ...	—	x	—	<i>Gelidium corneum</i> ...	x	x	x
<i>Sargassum ilicifolium</i> ...	x	x	x	<i>Caulerpa clavifera</i> ...	x	x	x
<i>Turbinaria ornata</i> ...	—	x	—	<i>Caulerpa plumaris</i> ...	—	x	—
<i>Padina pavonia</i> ...	x	x	x	<i>Valonia fastigiata</i> ...	—	x	x
<i>Dictyota dichotoma</i> ...	x	x	x	<i>Valonia confervoides</i> ...	—	x	—
<i>Lithothamnion polymorphum</i> ...	x	x	—	<i>Halimeda Opuntia</i> ...	x	x	x
<i>Acanthophora Thierii</i> ...	x	x	x	<i>Siphonocladus? filiformis</i> ...	—	x	—
<i>Jania tenella</i> ...	—	x	—	<i>Vaucheria</i> sp. ...	—	x	—
<i>Gracilaria crassa</i> ...	—	x	—	<i>Calothrix pulvinata</i> ...	x	x	x

Nearly one-half of the species are cosmopolitan in tropical seas; probably some of the six of which the distribution is not accurately ascertained are also cosmopolitan. One species appears to extend

only to the Pacific from the Indian Ocean, another only to the Atlantic from the Indian Ocean. The *Cymodocea*, though present in Africa, appears not to be recorded from the Mascarene Islands, and *Sargassum ilicifolium* though occurring in Malayan waters, has not yet been found on the coasts of Northern Australia. One species, *Dictyota dichotoma*, is rather more frequent in sub-tropical than in tropical seas and is cosmopolitan in both the northern and the southern hemispheres.

The next group of species to be considered—the “littoral”—includes many plants for which the evidence of introduction by the sea is almost as palpable as in the case of the “marine” species themselves. They germinate on the beaches, and grow only near the sea, preferably in muddy creeks or on the sand or shingle; their fruits and seeds are found in every “drift” and the species themselves occur on every Indian or Malayan coast. Such are the true mangroves and the species like *Avicennia*, *Excoecaria*, *Carapa*, that are constantly associated with the mangrove-vegetation; the sand-binding species like *Ipomoea biloba*, *Euphorbia Atoto*, *Sesuvium Portulacastrum*, *Vigna lutea*, *Thuarea sarmentosa*; the tropical sea-fence of *Pandanus odoratissimus*, *Desmodium umbellatum*, *Sophora tomentosa*, *Tournefortia argentea*, *Clerodendron inerme*, *Vitex Negundo*, with its concomitant climbing vegetation, *Canavalia obtusifolia*, *Ipomoea digitata*, *Argyrea tiliifolia*; the outer beach-forest of *Terminalia Catappa*, *Hernandia peltata*, *Erythrina indica*, *Stephegyne diversifolia*; the inner beach forest of *Cycas*, *Mimusops* and *Pisonia*; and even the species of the mud-flats within, like *Leuca sam-bucina*, *Hibiscus tiliaceus*, *Cynometra ramiflora*, *Flagellaria indica* and many more. The seeds of all these have been observed by the writer in the “drifts” of these islands and many of them have been noted, either in the Andamans and Nicobars, or in Narcondam, germinating on the beach. There are others, however, that are more doubtful, and, though the whole of the species for which this mode of introduction is conceivable are given below, the species for which any doubt is possible are enclosed in brackets and the more equivocal of these are discussed at the end of the list.*

* Since this paper was written and while these pages have been passing through the press two papers have appeared that deal with this section of the flora of the Malayan countries much more fully than the scope of the present paper permits. To these papers, viz:—*Schimper: Die Indo-Malayische Strandflora* (Jena: Gustav Fischer, 1891) and *Karsten: Ueber die Mangrove-Vegetation in Malayischen Archipel; Bibliotheca Botanica*, Heft 22 (Cassel: Theodor Fischer, 1891) neither of which had appeared when the writer's remarks were written and which he greatly regrets having been unable to refer to in the text, the writer would refer those who are interested in the subject of mangrove and coast plants and the influence of ocean-currents and their distribution.

TABLE XIV. *Distribution of "littoral" species present in the Coco Group.*

SPECIES.	Atlantic.		Indian Ocean.			Malay seas.	Pacific.		
	Eastern America.	Western Africa.	Eastern Africa.	Mascarene Islands.	Indian coasts. Burma, Malacca, Andaman, Java.	Malay Islands.	Northern Australia.	Polynesia.	Western America.
<i>Calophyllum inophyllum</i>
<i>Hibiscus tiliaceus</i>
<i>Thespesia populnea</i>
[<i>Sterculia rubiginosa</i> , var.]
5. <i>Heritiera littoralis</i>
<i>Carapa moluccensis</i>
<i>Colubrina asiatica</i>
<i>Leea sambucina</i>
[<i>Leea hirta</i>]
10. [<i>Dodonaea viscosa</i>
[<i>Dracontomelum mangiferum</i>]
<i>Desmodium umbellatum</i>
[<i>Desmodium triquetrum</i>]
[<i>Desmodium polycarpum</i>]
15. <i>Erythrina indica</i>
<i>Mucuna gigantea</i>
<i>Canavalia obtusifolia</i>
<i>Vigna lutea</i>
<i>Derris sinuata</i>
20. <i>Derris uliginosa</i>
<i>Pongamia glabra</i>
<i>Cæsalpinia Bonducella</i>
<i>Cæsalpinia Nuga</i>
<i>Sophora tomentosa</i>
25. <i>Cynometra ramiflora</i>
<i>Entada scandens</i>
<i>Rhizophora mucronata</i>
<i>Rhizophora conjugata</i>
<i>Cerriops Candolleana</i>
30. <i>Cerriops Roxburghiana</i>
<i>Bruguiera gymnorhiza</i>
<i>Terminalia Catappa</i>
<i>Lumnitzera racemosa</i>
<i>Gyrocarpus Jacquinii</i>
35. <i>Barringtonia speciosa</i>
<i>Barringtonia racemosa</i>
<i>Pemphis acidula</i>
<i>Sesuvium Portulacastrum</i>
<i>Stephegyne diversifolia</i>
40. <i>Guettarda speciosa</i>
<i>Ixora brunnescens</i>
<i>Morinda bracteata</i>
<i>Adenostemma viscosum</i>
<i>Pluchea indica</i>
45. <i>Wedelia scandens</i>
<i>Scævola Koenigii</i>

SPECIES.	Atlantic.		Indian Ocean.				Malay seas.	Pacific.		
	Eastern America.	Western Africa.	Eastern Africa.	Mascarene Islands.	Indian coasts.	Burma, Malacca, Andaman, Java.	Malay Islands.	Northern Australia.	Polynesia.	Western America.
[<i>Ardisia humilis</i>] ...	—	—	—	—	x	x	x	—	—	—
<i>Aegiceras majus</i> ...	—	—	—	—	x	x	x	x	x	—
<i>Mimusops littoralis</i> ...	—	—	—	—	—	—	—	—	—	—
50. <i>Cerbera Odollam</i> ...	—	—	—	—	x	x	x	x	x	—
<i>Ochrosia borbonica</i> ...	—	—	—	x	x	x	x	—	—	—
<i>Tabernæmontana crispa</i> ...	—	—	—	—	—	x	—	—	—	—
<i>Sarcolobus globosus</i> ...	—	—	—	—	—	x	x	—	—	—
<i>Cordia subcordata</i> ...	—	—	—	x	[x]	x	x	x	x	—
55. <i>Tournefortia argentea</i> ...	—	—	—	x	x	x	x	x	x	—
<i>Argyrea tiliaefolia</i> ...	—	—	—	—	—	x	x	—	—	—
<i>Ipomæa grandiflora</i> ...	—	—	—	x	x	x	x	x	x	—
<i>Ipomæa digitata</i> ...	—	x	x	x	x	x	x	x	x	x
<i>Ipomæa denticulata</i> ...	—	—	—	—	—	x	x	x	x	—
60. <i>Ipomæa biloba</i> ...	—	x	x	x	[x]	x	x	x	x	x
<i>Convolvulus parviflorus</i> ...	—	—	—	—	—	x	x	x	—	—
<i>Physalis minima</i> ...	—	x	x	x	x	x	x	x	x	x
[<i>Oroxylum indicum</i>] ...	—	—	—	—	—	x	x	—	—	—
<i>Eranthemum succifolium</i> ...	—	—	—	—	—	—	p	—	—	—
65. [<i>Peristrophe acuminata</i>] ...	—	—	—	—	—	x	x	—	—	—
[<i>Lippia nodiflora</i>] ...	—	x	x	x	x	x	x	x	x	x
<i>Premna integrifolia</i> ...	—	—	—	—	—	x	p	p	p	—
<i>Premna</i> sp. ...	—	—	—	—	—	—	—	—	—	—
<i>Vitex Negundo</i> ...	—	—	—	x	x	x	x	—	—	—
70. [<i>Vitex pubescens</i>] ...	—	—	—	—	—	x	x	—	—	—
[<i>Vitex Wimberleyi</i>] ...	—	—	—	—	—	—	—	—	—	—
<i>Clerodendron inerme</i> ...	—	—	—	—	—	x	x	x	x	—
<i>Avicennia officinalis</i> ...	—	x	x	x	x	x	x	x	—	x
<i>Boerhaavia repens</i> ...	—	—	x	x	x	x	x	x	x	—
75. <i>Pisonia aculeata</i> ...	—	x	x	x	x	x	x	x	—	—
[<i>Pisonia excelsa</i>] ...	—	—	—	—	—	—	x	—	—	—
<i>Achyranthes porphyristachya</i> ...	—	—	—	—	—	x	x	—	—	—
<i>Hernandia peltata</i> ...	—	—	—	x	x	x	x	x	x	—
<i>Cassytha filiformis</i> ...	—	x	x	x	x	x	x	x	x	x
80. <i>Euphorbia Atoto</i> ...	—	—	—	—	—	x	x	x	x	—
<i>Macaranga Tanarius</i> ...	—	—	—	—	—	—	x	—	—	—
<i>Cycas Rumphii</i> ...	—	—	—	—	—	x	x	x	—	—
<i>Crinum asiaticum</i> ...	—	—	—	—	—	x	x	x	x	—
<i>Tacca pinnatifida</i> ...	—	—	x	x	x	x	x	x	x	—
85. <i>Dracæna angustifolia</i> ...	—	—	—	—	—	—	x	x	—	—
[<i>Gloriosa superba</i>] ...	—	—	—	—	—	x	x	—	—	—
<i>Flagellaria indica</i> ...	—	—	—	x	x	x	x	x	—	—
<i>Caryota sobolifera</i> ...	—	—	—	—	—	—	x	—	—	—
[<i>Cocos nucifera</i>] ...	—	x	x	x	x	x	x	x	x	x
90. <i>Pandanus odoratissimus</i> ...	—	—	—	—	—	x	x	x	—	—
<i>Cyperus pennatus</i> ...	—	—	—	—	—	x	x	x	x	—
<i>Fimbristylis ferruginea</i> ...	—	x	x	x	x	x	x	x	x	x
<i>Thuarea sarmentosa</i> ...	—	—	—	x	x	x	x	x	x	—
<i>Ischæmum muticum</i> ...	—	—	—	—	—	x	x	x	x	—

This list includes 94 species for which sea-introduction is conceivable, and for the presence of most of the species it contains this mode of introduction is almost certainly responsible. The list might even be made more extensive than it is, for if *Sterculia rubiginosa*, which is a purely "littoral" species here as it is elsewhere throughout the Andaman and Nicobar groups—to which area the variety found in the Coco Islands is strictly confined,—be sea-introduced, there is no reason why some of the other species of *Sterculia* should not be added. As a matter of fact the writer has collected specimens of species of *Sterculia* in Narcondam and in Batti Malv, the first island a locality where certainly, the second one where probably, every species present has been somehow or other introduced. But no *Sterculia* seeds were recognised in the "drifts" and therefore the whole of the species have been left out except this purely 'littoral' one, while even it has been omitted from consideration in the analysis of the table which follows. Again, *Leea hirta* might well be sea-introduced if *Leea sambucina* is; their fruits are very similar and *Leea* fruits are common in the "drifts." All the fruits found, however, were precisely the same and seemed to be undoubtedly those of *Leea sambucina*, which is a very common species in the mud flats that skirt the mangrove-swamps, where it occurs as a considerable shrub or small tree with stilted roots that imitate the style and appearance of those of the mangroves. Both species, however, may have been introduced by fruit-eating birds; only one therefore, owing to its habitat, is taken as an example of this mode of introduction, the other being relegated to the list of species that are bird-introduced. Another species to which the same remarks apply is *Ardisia humilis*, which is a purely beach-forest species and, as such, is equally common here, on Narcondam, in the Andamans, and in the Nicobars; perhaps it is, on the whole, more likely to have been introduced owing to birds having eaten its purple-berried fruit. *Allophylus Cobbe*, which is almost certainly bird-introduced, may be quoted in support of this, for though it also occurs in the interior it is a common tree in the *Pandanus* fence and in the beach-forest. *Dracontomelum mangiferum* might be a sea-introduced species, for Mr. Hemsley records a *Dracontomelum*? fruit from the New Guinea "drift", with empty seed-cells however (*Challenger Reports; Botany*, vol. i, part 3, p. 290). And if *Dracontomelum* be included so might *Spondias* and *Canarium*, for though birds and bats eat the pulpy fruits of these species they cannot swallow the stone and, as in the case of *Terminalia Catappa*, can hardly do more than assist in dispersing them locally. *Desmodium triquetrum* and *Desmodium polycarpum* are both very common on the rocky parts of the coast just above the spray-line and their fruits therefore are extremely common in the "drifts." But it is not at all clear that they must therefore

be put down in the list of sea-introduced species; they are well-known as weeds of cultivation elsewhere, being diffused because of the readiness with which the indehiscent segments of their fruits attach themselves to the clothes of man and to the fur of his domestic animals. Here they are undoubtedly not weeds introduced by man, but it may well be that they have been introduced by birds, owing to fragments of their pods having attached themselves to their feathers. Another species to which the same remarks apply is *Adenostemma viscosum*, though this is more probably sea-introduced than the other; still another is *Boerhaavia repens*; perhaps all four are distributed at one time by the sea, at another by birds. *Lippia nodiflora* may also be a bird-introduced species; its seeds may have been brought in the pellets of mud that become attached to the feet, and to the feathers at the base of the bill of wading- and swimming-birds. *Achyranthes porphyristachya* which, from its situation in these islands, cannot be a weed introduced by man, and which is a common sea-shore species in the Nicobars and in the Laccadives also, may perhaps be bird-introduced like the *Desmodia*. If, as is suggested, now one agency, now another is responsible for the dispersal of these species, it is easy to understand why those species should all be "littoral" in these islands and yet occur as inland species in other localities. *Mucuna gigantea* will be readily admitted as an unequivocal example of this mode of distribution, as will *Derris sinuata*, for both occur in the beach-forest more commonly than they do on the ridges; so too, will the other *Leguminosæ* of the list except perhaps *Entada scandens*. And yet *Entada scandens* must be sometimes an introduced species, for it is one of the plants that occur on Narcondam, an island for which it seems impossible to postulate any previous land-connection; the writer moreover had the good fortune to find one of its enormous seeds germinating along with those of *Mucuna*, etc., on the sandy islet between Great Coco and Jerry.

Physalis minima is a species that at first suggests bird-introduction rather than sea-introduction, and its wide inland dispersal undoubtedly is largely owing to its fruits being eaten and to the subsequent voiding of its hard discoid seeds. But here it is only found close to the sea just above the spray-line and its fruits were found in the "drifts" here and there, the light bladder-like calyx amply accounting for their flotation; the pulp of the fruit probably protects the seeds, if such protection be necessary, from the action of the salt water. Among the *Convolvulaceæ*, for which this means of dispersal is not at all uncommon, the only species now included that calls for remark is *Convolvulus parviflorus*. It is, however, one of the commonest of the sea-face creepers along the west coast of Great Coco, and is equally common on Narcondam, Barren

Island, Rutland Island and Batti Malv, and is included in the list without any feeling of doubt in the mind of the writer. On the other hand, indeed, it is with some diffidence that another species, *Ipomœa Turpethum*, is omitted. All three species of *Vitex* given are "littoral," but while there seems no doubt that *Vitex Negundo* is sea-introduced, it is on the whole more probable that the others are introductions by fruit-eating birds. *Macaranga Tanarius* is also a species that from its habitat the writer has no hesitation in considering a sea-introduced species; another that he would have wished to include is *Blachia andamanica* which occurs on the coast with *Desmodium umbellatum*, *Pluchea indica* and other unequivocally littoral species. Moreover there are several of these shrubby and arboreal *Euphorbiaceæ* on Narcondam; their presence there indicates that some mode of introduction for species of this order must be possible. In the absence, however, of direct experiment with their seeds the others have been left to swell, probably unduly, the list of "remanent" species. *Tacca pinnatifida*, which is an inland as well as a coast species, may be bird-introduced, for its seeds are embedded in a sweet pulp. But though a species of ant is very fond of this fruit and scoops out all the ripe pulp, leaving the seeds bare but uninjured in an otherwise empty bag, no bird, so far as the writer could see, appears to eat them. The two *Pisonias*, one a climber, the other a tree, are both "littoral" and so may well be sea-introduced, but as both have peculiar fruits with glutinous lines along their sides they may equally well be bird-introduced species. The sticky lines along the angles of the fruits of *Pisonia excelsa* in particular have all the tenacity of bird-lime. As this species occurs some way inland as well as along the coast there is little doubt that, even if sea-introduced, its further dispersal is assisted by ground-feeding birds or small mammals. The fruits of two species of *Dipterocarpus* were seen in the "drifts," but the writer has no hesitation, from what is known regarding the delicacy of the seeds in this order and the rapidity with which their power of germinating is lost, in excluding both from the list. From what has already been said regarding "civilized" species it will be seen that though *Cocos nucifera* is undoubtedly capable of being introduced by the sea, it is probably not to this agency that its presence in these islands is due. *Caryota sobolifera*, however, which is throughout the whole Andaman group a very common species, both on flat and on rising ground, and which is as common on Narcondam as in the Cocos, is probably a sea-introduced species.

Peristrophe acuminata is another species that affects only the localities in which *Desmodium polycarpum* and its companions are found and ought probably to be included among the littoral species; in the absence

of further evidence, however, it is treated as only doubtfully sea-introduced. Another doubtful species is *Dodonaea viscosa*, a cosmopolitan species. Still another, equally doubtful, is *Gloriosa superba* which is exceedingly common in the coast zone on both the Coco Islands, and which the writer has collected, in the coast zone also and only there, in South Andaman, in Rutland Island, in Batti Malv, in Car Nicobar, in Narcondam, and in Barren Island, and which Dr. Alcock has collected, near the sea, in the Laccadives. On the whole therefore we might feel justified in considering it a sea-introduced species. But it is very abundant also throughout the whole of India; it extends from the Nilghiris and Central India to Rajputana, the Panjab, and the Gangetic plain, as well as to the Himalaya from Kamaon to Bhutan, and is common in Bengal, Assam and Burma. It cannot very easily be bird-introduced and one must therefore incline to the opinion that the agency responsible here is that of winds, a view which is favoured by the nature of its seeds. But even then it is not easy to suppose that winds could carry these as far as some of the islands mentioned and still that its distribution should be limited to South-Eastern Asia. *Oroxylum indicum* might possibly be sea-introduced, but on the whole has more probably been brought by wind. It need not be indigenous for it occurs in abundance in Narcondam. Though its fruits occur in the "drifts" they are always split open and it is unlikely that the seeds could remain attached to the fruit-segments during their transit from any of the neighbouring coasts.

Few of the cryptogams can be considered "littoral" and the statements that have been made of the possibility of *Fungi*, etc., being brought to ocean-islands attached to logs of wood or trunks of trees are not as a rule made by those who have seen and carefully examined ocean-drifts. Even *Polyporus sanguinalis*, which apparently has a predilection for dead or dying trunks of *Cocos nucifera*, being commoner there than in any other situation, was not found growing on any of the trunks that lie on the beaches exposed to the sun after having been soaked in salt water. The logs that are cast up on the beach and the roots that protrude from the sand at those points where denudation is going on, are scrubbed bare by the coral-sand and bleached white by the sun; they harbour no *Fungi* and seem preserved from decay by the treatment to which they have been subjected. There is, however, a striking exception in a "dry-rot" which attacks *Minusops littoralis* trunks and some other timbers. In the case of the Bullet-wood it was seen both on Great and Little Coco; the same appearance was presented by the remains of a wooden vessel in Little Coco. The appearance and consistence of this "dry-rot" so closely resemble the results of charring that it was difficult to realize that the wood in question had not been subjected to

fire. The effects of actual charring were, however, observed in the hollow trunk of a large *Mimusops* near the shelter huts at the south end of Great Coco; closer comparison shows that the product of the *Fungus* has a facies of its own unlike that of true charcoal. This difference is difficult to express in words, but is very recognisable when the two things are placed side by side. The phenomenon was not noticed in the case of *Erythrina*, *Heritiera*, *Stephegyne*, or other dead trees on the beach.

Excluding from consideration all the doubtful species enclosed in brackets we find that there are 80 unequivocally sea-introduced plants, or more than one-fourth of the phanerogamic species and over 22 per cent. of the entire flora. On consulting the distribution it is seen how greatly the coast flora is one characteristic of the Indian Ocean and of Malayan Seas, particularly the latter, since 76 species, or 97 per cent., occur on the shores of the Malay Islands, whereas only 66, or 83 per cent., occur on the Indian coasts of the Sea of Bengal. Moreover one of these, *Sarcolobus globosus*, might almost be omitted, its only Indian locality being the Sunderbuns, at the head of the Bay of Bengal. Another, *Ipomoea denticulata*, though extending up the eastern side of the Bay to the coast of Arracan, is, on the western side, confined to Ceylon. This indication of a tendency to extension eastward is borne out by the features of the further distribution of these species, for 60 species, or 76 per cent., extend south-eastward to the shores of northern Australia, while only 47, or 59 per cent., extend south-west to the Mascarene Islands; and 51 species, or 64 per cent., occur in one or other of the Polynesian groups, while only 36, or 46 per cent., reach continental East Africa. But, while this is the case, it is interesting to note that 21 species, or 24 per cent., occur on the African Atlantic coast, and 15 species, or 19 per cent., cross the Atlantic to the Eastern coasts of America, whereas only 13 species, or 16 per cent., extend across the Pacific from Polynesia to the Western American coasts. These features of the littoral flora are given more compactly in the subjoined table.

TABLE XV. *Extension of "littoral" species present in the Coco Group.*

Species extending westward to					Species present in the	Species extending eastward to			
America. (Atlantic Coasts.)	West Africa. (Atlantic Coasts.)	Eastern Africa.	Mascarene.	India and Ceylon.	COCO GROUP.	Malay Archipelago.	North Australia.	Polynesia.	America. (Pacific Coasts.)
15	21	36	47	66	80	76	60	51	13
19%	24%	46%	59%	83%	100%	97%	76%	64%	16%

An analysis of the table of distribution from the opposite point of view is given below; from it we learn that 11 species, or 14 per cent., are cosmopolitan on tropical sea-shores; that four more are nearly cosmopolitan, being present in both hemispheres; that only four, so far as is known, are limited to the coasts of these islands, the Andamans and the Nicobars; and that, excepting these four, every one of the species is found on the Malayan Coasts. So far then as the "littoral" species are concerned we must conclude that the flora of the Coco Group is decidedly Malayan.

TABLE XVI. *Analysis of distribution of "Littoral" species.*

Present on both Pacific and Atlantic coasts:—	19
Cosmopolitan on tropical sea-shores:—	11
Almost ditto, (present in both hemispheres):—	4
Absent from Pacific American coasts only:—	2
Absent from Pacific Polynesian coasts only	1
Absent from Eastern African and Mascarene coasts only	1
Absent from New World entirely:—	4
Present on Atlantic and Indian Ocean (not on Pacific) coasts	1
Present on Pacific and Indian Ocean (not on Atlantic) coasts	33
Extending from Africa to Polynesia:—	15
On all intervening shores:—	14
Absent only from Northern Australia	1
Extending from Mascarene islands to Polynesia:—	9
Extending from India to Polynesia	8
Extending from Coco Islands to Polynesia	1
Confined to Indian Ocean and Malayan Seas	27
Western species:—	4
Extending from Africa to Australia:—	2
In both Africa and Mascarenes	1
In Mascarenes, not in Africa	1
Extending from Africa to Malaya only	2
In Continental Africa, not in Mascarenes	1
In Mascarenes, not in Africa	1
Eastern species:—	6
Extending from Australia to India	3
Extending from Australia to the Coco Group	3
Central species:—	17
Extending from India to Malaya	8
Extending from Coco Group to Malaya	5
Extending from Coco Group to Nicobars only	4

TOTAL number of "Littoral" species. 80

In discussing the inland "immigrant" species the first agency to be considered is that of winds. This influence must here be stronger

than in many places, for though the south-west monsoon, which blows for half the year, sweeps only over a wide expanse of sea before it reaches the islands, there is a very distinct and tolerably powerful north-east monsoon which, during a considerable part of the remaining half-year, blows from the direction of the adjacent Burmese coast.

It is, however, easy to overrate the effect of this agency and however well adapted certain fruits, such as those of the two *Dipterocarpi*, *Terminalia bialata*, *Pterocarpus indicus*, *Sterculia companulata*, *Porana spectabilis*, *Illigera conyzadenia*, *Ventilago calyculata*, or seeds, such as those of *Sterculia alata*, *Gloriosa superba*, *Aristolochia tagala*, may at first sight appear to be for transmission by wind, it seems very doubtful on further consideration if any of those mentioned could possibly be carried so far as from the nearest mainland to these islands. In most of these cases the wings of the fruits or seeds can only, as in that of *Gyrocarpus*, assist in local dispersal. Regard must be paid, too, to the usual situation of the species, and in the case of *Orchids*, for example, the seeds of which are light, and well adapted for carriage in this way, it is doubtful if *Calanthe veratrifolia*, which is always found in densely shady places, could have been brought in this way. Similarly among the inland *Cryptogams*, for all of which except *Chara* this means of dispersal is doubtless possible, it seems more probable that *Acrostichum appendiculatum*, which affects the same localities as *Calanthe*, and *Ceratopteris thalictroides*, which undoubtedly is sometimes, if not always, bird-introduced, ought to be excluded from this list.

The table below gives the whole of the possibly "wind-introduced" species present in the group.

TABLE XVII. *Distribution of Wind-introduced "inland" species present in the Coco Group.*

SPECIES.		S. E. Asia.							
		Africa.	India.	Indo-China.	Malaya.	Australia.	Polynesia.	America.	Barren Island.
<i>Bombax insigne</i>	—	×	×	×	—	—	—	—
<i>Eriodendron anfractuosum</i>	×	×	×	×	—	—	×	—
<i>Dodonæa viscosa</i>	×	×	×	×	×	×	×	×
[<i>Vernonia cinerea</i>]	×	×	×	×	×	×	×	—
5. <i>Vernonia divergens</i>	—	×	×	—	—	—	×	—
<i>Bumea virens</i>	—	×	×	—	—	—	—	—
[<i>Strophanthus Wallichii</i>]	—	—	[×	—	—	—	—	—

SPECIES.		Africa.	S. E. Asia.				Australia.	Polynesia.	America.	Narcondam.	Barren Island.
			India.	Indo-China.	Malaya.						
Anodendron paniculatum	...	—	—	x	x	x	—	—	—	x	—
Chonemorpha macrophylla	...	—	—	x	[x]	x	—	—	—	x	—
10. Hoya parasitica	...	—	—	—	x	x	—	—	—	x	x
Hoya diversifolia	...	—	—	—	x	x	—	—	—	x	x
Dischidia nummularia	...	—	—	—	x	x	x	—	—	x	x
Oroxylum indicum	...	—	—	x	x	x	—	—	—	x	x
Heterophragma adenophyllum	...	—	—	—	x	—	—	—	—	x	—
15. Aristolochia tagala	...	—	—	—	x	x	—	—	—	x	x
Dendrobium secundum	...	—	—	—	x	x	—	—	—	—	—
[Calanthe veratrifolia]	...	—	—	x	[x]	x	x	—	—	—	—
Dorites Wightii	...	—	—	—	x	x	—	—	—	—	—
Aërides multiflorum	...	—	—	—	x	x	—	—	—	—	—
20. Pholidota imbricata	...	—	—	—	x	x	x	—	—	—	x
Dioscorea glabra	...	—	—	—	x	x	x	—	—	x	x
Dioscorea pentaphylla	...	—	—	—	x	x	x	—	—	x	x
Gloriosa superba	...	—	—	—	x	x	x	—	—	x	x
[Ischæmum ciliare]	...	—	—	—	x	x	x	—	—	—	x
25. [Andropogon contortus]	...	—	x	x	x	x	x	x	x	—	x
Davallia solida	...	—	—	—	[x]	x	x	x	—	x	—
Adiantum lunulatum	...	—	x	x	x	x	x	x	x	—	—
Polypodium irioides	...	—	x	x	x	x	x	x	x	x	—
Polypodium adnascens	...	—	x	x	x	x	—	x	x	—	—
30. Polypodium quercifolium	...	—	—	—	x	x	x	x	—	x	x
Vittaria elongata	...	—	x	x	x	x	x	x	—	x	—
Acrostichum scandens	...	—	—	—	x	x	x	x	—	x	x
[Acrostichum appendiculatum]	...	—	—	—	x	x	x	—	—	x	x
Lygodium flexuosum	...	—	x	x	x	x	x	—	—	x	—
35. Calymperes Dozyanum	...	—	—	[x]	[x]	x	—	x	—	p	—
Bryum coronatum	...	—	x	x	x	x	x	x	x	x	x
Collema nigrescens	...	—	x	x	x	x	x	x	x	x	—
Physcia obscura	...	—	x	x	x	x	x	x	x	—	—
Lentinus leucochrous	...	—	—	—	[x]	x	—	—	—	—	—
40. Lenzites deplanata	...	—	—	—	x	x	—	—	—	—	—
Lenzites subferruginea	...	—	—	—	x	x	x	—	—	—	—
Polyporus fulvus	...	—	—	—	[x]	x	—	—	—	—	—
Polyporus xanthopus	...	—	x	x	x	x	x	x	x	p	—
Polyporus sanguineus	...	—	x	x	x	x	x	x	x	p	—
45. Polyporus grammatocephalus	...	—	—	—	x	x	x	—	x	—	—
Polyporus australis	...	—	x	x	x	x	x	x	x	x	—
Hexagona pergamenea	...	—	—	[x]	[x]	x	—	—	—	—	—
Hexagona sericeo-hirsuta	...	—	—	—	[x]	x	—	—	—	—	—
Hexagona tenuis	...	—	x	—	[x]	x	—	—	x	—	—
50. Dedælea flabellum	...	—	—	—	x	[x]	—	—	—	—	—
Dedælea sanguinea	...	—	—	—	x	[x]	—	—	—	—	—
Dedælea quercina	...	—	x	x	x	x	x	x	x	p	—
Dedælea concentrica	...	—	x	x	x	x	x	x	x	x	—
Thelephora incrustans	...	—	x	x	x	x	x	x	x	x	x
55. Bovista lilacina	...	—	x	x	x	x	x	x	x	—	—
Hirneola polytricha	...	—	x	x	x	x	x	x	x	—	—
Daldinia vernicosa	...	—	—	—	x	x	—	x	x	—	—
Rhytisma sp.	—	—	—	[x]	x	—	—	x	x	x

It will be seen that the majority of the species in this table are actually present in one or other of the two volcanic islands of the Andaman Sea, Narcondam and Barren Island, and even in these cases where they are not present allied species are. There is a *Bombax* in Narcondam and though its specific identity or otherwise with the Andamans one cannot be here discussed, it is evident that any *Bombax* may be wind-introduced. And whatever agency explains the presence of *Bombax* will, *pari passu*, explain that of *Eriodendron*.

Not a single orchid was found on Narcondam though on Barren Island two were found—a species of *Dendrobium* on trees on the outer cone, and *Pholidota imbricata*, which occurs at the top of the inner cone within the crater-cup where the ground is kept moist by the condensation of escaping steam. Then the *Hoyas* are both present in great abundance on the exposed rocks and tall trees of both islands. The most doubtful species undoubtedly are *Aristolochia tagala*, *Gloriosa superba*, and, especially, the two species of *Dioscorea*. Yet these must all be immigrant. The writer has collected *Aristolochia tagala* on Batti Malv, a small outlying uninhabited fragment of the Nicobar Group, on Barren Island, and on Narcondam. And even if it be claimed that on Batti Malv the species may be a remanent one on the other two islands it, like every other species, *must* be immigrant. The case of *Gloriosa superba* has already been discussed when dealing with the species introduced by the sea. The *Dioscoreas* are still more difficult to explain, but it hardly seems as if they could be bird-introduced, and it is almost as difficult to think that they have been introduced by the sea. They are never littoral, being even in these islands strictly confined to the higher dry ridges. Yet they are certainly not necessarily remanent, for the writer has collected not these only but a third species, *Dioscorea bulbifera*, or at all events a bulbiferous one, which is present along with these two in great quantity in Narcondam and especially in Barren Island. In both these islands the species must all be immigrant and from the physiographical history of Barren Island should there be, biologically speaking, extremely recently so. Though no *Strophanthus* occurs in Barren Island, an *Aganosma* is common there. The distribution of the *Cryptogams* of this class calls for little remark, the peculiarities displayed in this respect by the *Fungi* being probably altogether owing to this class being imperfectly known in most floras. The presence, for instance, of two species here that are recorded only from North America probably implies that they are both in reality cosmopolitan or nearly so.

To the 58 species enumerated above should be added six imperfectly represented *Cryptogams*, giving a total of 64 species; the following table contains an analysis of their distribution.

TABLE XVIII. *Analysis of the distribution of Wind-introduced species.*

Species present in both hemispheres :—	21
Cosmopolitan in the tropics (<i>Phanerog.</i> 3 ; <i>Cryptog.</i> 12)	15
Almost Cosmopolitan (<i>Phanerog.</i> 1 ; <i>Cryptog.</i> 5)	6
In Africa, Asia, Polynesia, America (<i>Cryptog.</i>)	2
In Africa, Asia, America (<i>Phanerog.</i>)	1
In Asia, Australia, America (<i>Cryptog.</i>)	1
In Asia, America (<i>Cryptog.</i>)	2
Confined to Old World :—	43
{ In Africa, Asia, Australia, Polynesia (<i>Cryptog.</i>)	1
{ In Africa, Asia, Australia (<i>Cryptog.</i>)	1
{ In Africa, Asia (<i>Cryptog.</i>)	1
{ In Asia, Australia, Polynesia (<i>Cryptog.</i>)	3
{ In Asia, Australia, (<i>Phanerog.</i>)	2
{ In Asia, Polynesia (<i>Cryptog.</i>)	1
Confined to Asia, (<i>Phanerog.</i> 18 ; <i>Cryptog.</i> 16)	34
TOTAL of possibly wind-introduced species :—	64
Phanerogams	25
Cryptogams	39

We thus see that 32 per cent. of the species are cosmopolitan, but that at the same time as many as 53 per cent. are confined to South-Eastern Asia, figures which tend to shew that the agency of wind appears to be less active than we might expect. So far as the more local distribution is concerned we find that 40 species, or 62 per cent., may have reached the islands either from Indo-China or from Malaya ; 10 species, or 15 per cent., appear to be local species ; 3 species appear to have reached the islands from Malaya and one must have come either from Malaya or Ceylon, these four are, however, all *Cryptogams* and may possibly yet be found in Indo-China. Even if it be assumed that these do not occur in Burma, it leaves the south-west monsoon responsible for the introduction of only $6\frac{1}{2}$ per cent. of this group of species. The remaining 10 species, or about 16 per cent. of the class, have more probably been introduced by the north-east monsoon, a circumstance that might be expected, seeing that this monsoon blows from the direction of the nearest land. And as this is the case it will follow that the probability is strong that most of the species which may, so far as their present distribution indicates, have come either from Indo-China or Malaya have in reality come from the north-east. The only species of the kind for which this is doubtful is *Chonemorpha macrophylla*, which, though abundant in India and in the Himalaya, and equally so in Malaya and in the Andamans, has not yet been recorded from any part of Indo-China to the east of Khasia and Sylhet.

The last group of introduced species—those carried by birds—has now to be considered. In discussing this it is necessary to distinguish

between species the seeds or fruits of which may arrive attached to the bodies of birds, and species of which the fruits and seeds have been eaten. The species carried externally will be first considered and may further be conveniently subdivided into two sub-groups, *viz.*, species that have probably been introduced only by swimming- or wading-birds, and species introduced by birds of any kind. The species of the first kind give a sub-group distinguished by an aquatic or paludine habitat, and characterised by small inconspicuous fruits or seeds that readily become attached, along with pellets of mud, to the feet, the leg-feathers, or the feathers at the base of the bill, of birds frequenting pools and marshes. The following table exhibits the whole of this kind present in the Coco Group.

TABLE XIX. *Distribution of the species probably introduced by swimming or wading birds.*

				Africa.	S. E. ASIA.			Australia.	Polynesia.	America.
					India.	Indo-China.	Malaya.			
	<i>Nymphaea Lotus</i>	...	...	x	x	x	x	—	—	—
	<i>Limnanthemum indicum</i>	...	...	x	x	x	x	x	x	x
	<i>Hygrophila quadrivalvis</i>	...	...	—	x	x	—	—	—	—
	<i>Lippia nodiflora</i>	...	...	x	x	x	x	x	x	x
5.	<i>Polygonum barbatum</i>	...	...	x	x	x	x	x	—	—
	<i>Zanichellia palustris</i>	...	...	x	x	x	x	x	x	x
	<i>Cyperus polystachyus</i>	..	..	x	x	x	x	x	x	x
	<i>Cyperus elegans</i>	...	...	—	x	x	x	—	—	—
	<i>Cyperus dilutus</i>	...	...	—	x	x	x	—	—	—
10.	<i>Fimbristylis quinqueangularis</i>	...	...	x	x	x	x	x	—	—
	<i>Fimbristylis miliacea</i>	...	...	x	x	x	x	x	—	x
	<i>Scirpus subulatus</i>	...	...	x	x	x	—	—	—	—
	<i>Paspalum scrobiculatum</i>	...	...	x	x	x	x	x	—	—
	<i>Panicum Myurus</i>	...	...	x	x	x	x	x	x	x
15.	<i>Ceratopteris thalictroides</i>	...	...	x	x	x	x	x	x	x
	<i>Chara foetida</i>	...	...	—	x	x	x	—	—	—

The next table gives the analysis of this distribution; the most striking feature the two tables reveal is the extent to which species of this kind are cosmopolitan. Among the non-cosmopolitan species the indications are altogether in favour of introduction from the northward and westward, for while only 10 of the species occur in Australia, and only the 6, which are all cosmopolitan, occur in Polynesia, 12 occur in Africa and 7 in America. Of the more local distribution we learn that none need necessarily have been introduced from Malaya since the 14 that occur

there all occur in India and Indo-China also, while two that occur in India and Indo-China but do not occur in Malaya must have been introduced from the north. This being the case the probability is that the others have mainly been introduced from the same direction, a circumstance quite in accordance with expectation, since it is from the north that the stream of migration of marsh- and water-birds annually flows. During our visits to the islands snipe were found in the meadow near the lake on Great Coco, while teal and other water-birds frequented the lake itself and abounded in the lagoon on Little Coco.

TABLE XX. *Analysis of distribution of Marsh and Aquatic species.*

Present in both Hemispheres :—	7
Cosmopolitan in the tropics:.....	6
Nearly cosmopolitan (absent from <i>Polynesia</i>)	1
Confined to Eastern Hemisphere	9
Africa, Asia, Australia	3
Africa, Asia	2
Confined to South-eastern Asia	4
TOTAL species probably introduced by water-birds	16

The second kind of species that may be introduced by becoming attached externally to birds is somewhat more difficult to deal with. *Urena lobata*, which is here clearly not a weed, may have been introduced in this way: its fruits sticking, burr-like, to the feathers of some bird; *Buettneria andamanensis*, might also have been thus introduced, though this is not so probable as in the other case. Three of the *Desmodia*—*Desmodium triquetrum*, *D. laxiflorum* and *D. polycarpon*—may very well owe their introduction to this mode of dispersal. *Boerhaavia repens*, as has already been said, is probably sea-introduced, though there is no reason why it may not partly owe its dispersal to bird-agency. Its habitat on these islands is always the rocky headlands or isolated rocks along the coast on which sea-birds sit to devour the *Grapsus* crabs they capture on the wave-washed ledges below, and nothing is more likely than that the fruits may become at times attached to their feet and be carried at least from point to point along the coast. The *Pisonias* may both very well have been introduced in this fashion, though it is less likely as regards *P. aculeata* than as regards *P. excelsa*. From what has been already said of this tree in discussing it among the "littoral" species, it will be evident that its fruits are of such a nature as to admit of their being carried for great distances attached to a bird's feet or body, if only the bird should happen to come in contact with them, and the objection that scraping-birds, which might do so, are not often migratory, while frugivorous birds, which are migratory, would not come in contact with the fruits because they are not likely to alight on a *Pisonia*, is not a valid one.

Though many such birds, as for instance *Carpophaga bicolor*, appear always to feed on trees and therefore would probably very rarely come in contact with *Pisonia* fruits, many others, as for instance *Calénas nicobarica*, appear to feed as much or more on the ground, on fallen ripe fruits, as on the trees that bear the fruits they eat.* And in such a case there is no doubt that they might very easily come in contact with *Pisonia* fruits. Though essentially a beach-forest tree, the writer has collected specimens of *Pisonia excelsa* (and the tree was plentiful where he did so) three or four miles inland and 250—300 feet above sea-level; some mode of dispersal other than, or at any rate supplementing, ocean-dispersal, must therefore, as has already been pointed out, be postulated as regards this species. Of the grasses placed in this list *Andropogon contortus* already mentioned as possibly wind-introduced, much more probably owes its presence to this mode of introduction. *Oplismenus compositus* is also sufficiently well endowed to render this mode of introduction likely. The only *Cryptogam* likely to have been thus introduced is *Acrostichum appendiculatum*, the spores of which might easily get brushed off by the feathers of a bird walking through a patch of it. This would also apply to the seeds of *Calanthe*.

The following table gives the names and distribution of the species likely to be thus introduced or likely to have their local dispersion assisted by this means.

TABLE XXI. *Distribution of species probably introduced attached to the feet or feathers of land-birds.*

SPECIES.					Africa.	S. E. ASIA.						
						India.	Indo-China.	Malaya.	Australia.	Polynesia.	America.	
Urena lobata	×	×	×	×	×	×	×	×	
[Buettneria andamanensis]	—	—	[×	—	—	—	—	—	
Desmodium triquetrum	×	×	×	×	×	—	—	—	
Desmodium laxiflorum	—	—	×	×	×	—	—	—	
5. Desmodium polycarpum	×	×	×	×	×	×	×	—	
[Loranthus longiflorus]	—	×	×	×	×	—	—	—	
[Boerhaavia repens]	×	×	×	×	×	×	×	—	
[Pisonia aculeata]	×	×	×	×	×	—	—	×	
Pisonia excelsa	—	—	[×	×	×	—	—	—	
10. Calanthe veratrifolia	—	×	[×	×	×	×	—	—	
Oplismenus compositus	×	×	×	×	×	×	×	—	
Andropogon contortus	×	×	×	×	×	×	×	×	
Acrostichum appendiculatum	—	×	×	×	×	—	—	—	

* This at least was the writer's experience in Batti Malv, the small uninhabited almost inaccessible island of the Nicobar Group already referred to, where *Calénas nicobarica* breeds, and on which thousands of individuals of this species congregate.

The list is so short that an analysis of it is unnecessary; it is sufficient to note that the possibility of introduction from Malaya or from Indo-China is, so far as its evidence goes, evenly balanced.

While the two lists probably include all the species usually introduced by being attached externally to birds they do not exhaust all the possibilities of the case. For, if the mud of a marsh may fix the seeds or fruits of paludine species to the feet or head of wading-birds, other substances may fix the seeds of forest species to the bodies of forest-birds. There is almost no limit to the number of species that might be suggested as introduced in this way, provided their seeds be sufficiently small; this very circumstance, combined with the necessarily hypothetical nature of the subject, makes it impossible to attempt the suggestion of this mode of dispersal in connection with any particular species.*

The next kind of "bird-introduced" species to be considered—those introduced in consequence of having been eaten—may also be conveniently divided into two sub-groups; one consisting of species where dissemination by birds is an every-day process, the other consisting of species that can only be occasionally disseminated in this fashion since the process implies the destruction of the bird itself.

The first sub-group corresponds fairly closely with those species

* The following facts will shew that, though necessarily hypothetical, the subject is not far-fetched but is, on the contrary, highly deserving of attention. When in Narcondam the writer was particularly anxious to obtain the seeds of a species of *Bombax* present there, for sowing at Calcutta; for some days the search was hopeless because the capsules as they ripen are broken open and the seeds are eaten by a species of Horn-bill that is common in the island, while any seeds that escape the birds and fall to the ground are devoured by the rats that swarm in the place. At length under one tree, where there happened to be on the under-growth one or two large spider's webs, four seeds were found sticking in these webs; these were the only seeds he was fortunate enough to obtain; they were brought to Calcutta, germinated there, and the four young trees are now alive in the Botanic Garden. This will shew that seeds easily may, and at times do, stick in spider's webs.

In spring 1890 a Barbet was found lying on the ground in the Botanic Garden unable to fly; on being picked up and examined it was found that its left wing and left leg were fixed together by means of a spider's web; on freeing these it was found that the toes of its left foot were further bound up in a ball and the flight-feathers were firmly tied together. When finally completely freed from its entanglement the bird flew away, frightened, but physically uninjured. This will shew that birds do sometimes come in contact with spider's webs and that these are capable not merely of fixing objects to a bird's feathers but of fixing these feathers so that the bird itself cannot move them.

All that is therefore required in order to establish the truth of the hypothesis is direct observation of a bird having come in contact with a spider's web which happened to have seeds lodged in it at the time, and of its carrying away seeds and web together.

that have pulpy fruits with a hard stone or with hard indigestible seeds. It cannot, however, be held to include all these, for though birds *do* eat the pulpy part of the fruits of *Canarium*, *Spondias* and *Dracontomelum*, the stones of these are too large to be swallowed; probably therefore some other mode of dispersal must be held accountable for the presence in these islands of species of those genera. For *Dracontomelum* introduction by the sea has been suggested, though doubtfully; the others are left, with some reluctance, among the "remanent" species. There are other species for which this agency is only doubtful, such as *Miliusa*, the fruits of which do not look very inviting—some *polyalthias* are, however, so dispersed, *e. g.*, *P. longifolia* by frugivorous bats; *Physalis minima* might well enough have been introduced in this way, but is, all things considered, more probably sea-introduced; some of the *Convolvulaceæ* may also have been thus introduced. Moreover it must not be forgotten that indirect introduction in this way is not impossible. As has been pointed out, some of the fruit-eating pigeons are ground-feeding creatures, and if a sticky pulpy fruit should fall into a patch of *Opismenus*, *Panicum*, *Aneilema*, or other small-fruited or -seeded herbaceous ground-species, the seeds or fruits of these may become attached to the fruits in question and, if then swallowed unnoticed by a fruit-eating bird, be voided uninjured along with the stone or seeds of the fruit itself and subsequently germinate. The subjoined table gives a list of all the species probably directly introduced; the indirect method, as being too hypothetical for discussion here, is not mentioned in connection with any particular species.

As in the case of species introduced by wind the occurrence of species of this kind in the islands of Narcondam and Barren Island is given; these being islands for which it is necessary at the outset to exclude from consideration any hypothetical "remanent" element.*

* This part of the list is not so complete as it might be, since owing to the pressure of other duties the writer has not yet been able to complete the examination of the species collected by him in those islands in April 1891. This much may be said, that all the species quoted as occurring there do occur. But many of the others though not present are represented by nearly allied species and by species of this kind. There is for example at least one *Grewia* in Narcondam, there are several *Rubiaceæ* and there is an *Amorphophallus*. In Narcondam too there is a species of *Strychnos*, while a species of *Eugenia* is common in Barren Island. These two isolated localities therefore present two genera, with species that have fruits of the kind now discussed, of which no representatives were met with in the Coco Group. Similarly Batti Malv, equally isolated, and quite uninhabited, has an *Alangium* and a *Datura*; it may therefore be repeated that this list by no means overstates the possibilities of the agency in such a locality as this.

TABLE XXII. *Species probably introduced by fruit-eating birds.*

SPECIES.				S. E. ASIA.									
				Africa.	India.	Indo-China.	Malaya.						
[Miliusa sp.] ...	...	...	...	—	—	[x]	—	—	—	—	—	—	—
Capparis sepiaria ...	...	...	...	—	x	x	x	—	—	—	—	x	x
Capparis tenera ...	...	...	...	—	x	x	x	—	—	—	—	x	—
Grewia laevigata ...	...	...	...	x	—	x	x	x	—	—	—	—	—
5. Grewia Microcos ...	...	...	...	—	x	x	x	x	—	—	—	—	—
Glycosmis pentaphylla ...	...	...	...	—	x	x	x	x	—	—	—	x	—
Garuga pinnata ...	...	...	...	—	x	x	x	x	—	—	—	x	—
Aglaia andamanica ...	...	...	...	—	—	[x]	—	—	—	—	—	?	—
Cansjera Rheedii ...	...	...	...	—	x	[x]	x	x	—	—	—	x	—
10. Sarcostigma edule ...	...	...	...	—	—	[x]	—	—	—	—	—	—	—
Salacia prinoides ...	...	...	...	—	x	x	x	x	—	—	x	—	—
Zizyphus Ænoplia ...	...	...	...	—	x	x	x	x	—	—	—	—	—
Vitis pentagona ...	...	...	...	—	—	x	—	—	—	—	—	—	—
Vitis carnosia ...	...	...	...	—	x	x	x	x	—	—	—	—	—
15. Vitis pedata ...	...	...	...	—	x	x	x	x	—	—	—	x	—
Leea hirta ...	...	...	...	—	x	x	x	x	—	—	—	x	—
Erioglossum edule ...	...	...	...	—	x	x	x	x	—	—	—	x	—
Allophylus Cobbe ...	...	...	...	—	x	x	x	x	—	—	—	x	—
Sapindus Danura ...	...	...	...	—	x	x	x	—	—	—	—	—	—
20. Pometia tomentosa ...	...	...	...	—	[x]	x	x	x	—	—	—	—	—
Odina Wodier ...	...	...	...	—	x	x	x	—	—	—	—	x	—
Semecarpus subpanduriformis ...	...	...	...	—	—	x	—	—	—	—	—	—	—
Semecarpus heterophylla ...	...	...	...	—	—	[x]	x	—	—	—	—	x	x
Memexylon edule ...	...	...	...	—	[x]	x	x	—	—	—	—	x	—
25. Modecca cordifolia ...	...	...	...	—	—	[x]	x	—	—	—	—	—	—
Trichosanthes palmata ...	...	...	...	—	x	x	x	x	—	—	—	x	—
Mussaenda calycina ...	...	...	...	—	x	x	x	—	—	—	—	—	?
Pavetta indica ...	...	...	...	—	x	x	x	x	—	—	—	—	—
Psychotria adenophylla ...	...	...	...	—	—	x	—	—	—	—	—	—	—
30. Pæderia foetida ...	...	...	...	—	—	x	x	—	—	—	—	x	x
Ardisia humilis ...	...	...	...	—	x	x	x	—	—	—	—	x	—
Rauwolfia serpentina ...	...	...	...	—	x	x	x	—	—	—	—	x	—
Erycibe paniculata ...	...	...	...	—	x	x	x	—	—	—	—	—	—
[Physalis minima] ...	...	...	...	x	x	x	x	x	x	x	—	—	x
Myristica Irya ...	...	...	...	—	[x]	x	x	—	—	—	—	—	—
35. Myristica glauca ...	...	...	...	—	—	[x]	x	—	—	—	—	x	—
Dehaasia Kurzii ...	...	...	...	—	—	[x]	—	—	—	—	—	—	—
Bridelia tomentosa ...	...	...	...	—	x	x	x	x	—	—	—	x	—
Bridelia Kurzii ...	...	...	...	—	—	[x]	—	—	—	—	—	—	—
Flueggea microcarpa ...	...	...	...	x	x	x	x	x	—	—	—	x	—
40. Phylloclamys spinosa ...	...	...	...	—	x	x	x	—	—	—	—	—	—
Plecosperrum andamanicum ...	...	...	...	—	—	[x]	—	—	—	—	—	—	—
Ficus Benjamina ...	...	...	...	—	x	x	x	x	—	—	—	—	—
Ficus Rumphii ...	...	...	...	—	x	x	x	—	—	—	—	x	x
Ficus retusa ...	...	...	...	—	x	x	x	x	—	—	—	x	x

SPECIES.			Africa.	S. E. ASIA.			Australia.	Polynesia.	America.	Narcondam.	Barren Island.
				India.	Indo-China.	Malaya.					
45. <i>Ficus brevicuspis</i>	—	—	—	[x]	x	—	—	—	—	—
<i>Ficus callosa</i>	—	—	x	x	x	—	—	—	—	—
<i>Ficus hispida</i>	—	—	x	x	x	x	—	—	x	x
<i>Ficus grisea</i>	—	—	—	x	[—	—	—	—	—
<i>Antiaris toxicaria</i>	—	—	x	x	x	—	—	—	—	—
50. <i>Artocarpus Gomeziana</i>	—	—	—	[x]	x	—	—	—	x	—
<i>Zingiber</i> sp.	—	—	—	[x]	—	—	—	—	—	—
<i>Costus speciosus</i>	—	—	x	x	x	—	—	—	—	—
<i>Smilax macrophyllus</i>	—	—	x	x	—	—	—	—	—	—
<i>Asparagus racemosus</i>	—	—	x	x	x	—	—	—	—	—
55. <i>Dracæna spicata</i>	—	—	x	x	x	—	—	—	—	—
<i>Amorphophallus</i> sp.	—	—	—	[x]	—	—	—	—	—	—
<i>Pothos scandens</i>	—	—	x	x	x	—	—	—	x	—

The most remarkable feature of the list is that it gives us for the first time a well-defined group of species none of which extend to America or even to Polynesia, and only two of which extend to Africa, though no fewer than 15, or 27 per cent., extend to Australia. The remaining 40 are confined to South-Eastern Asia. As regards their more local distribution there, 17, or 31 per cent., are confined to lands lying to the east of the Sea of Bengal, while 3 more occur in Ceylon but not in India, a circumstance which perhaps indicates that birds which feed on these species pass from Malaya to Ceylon but do not visit India. If this be the case the agency of frugivorous birds may partly explain the existence of a Ceylon element in the flora of the Andamans generally, a circumstance that has, as already said, been made the subject of remark by the late Mr. Kurz, (*Report on the Vegetation of the Andaman Islands*, p. 15); this point will be more fully discussed below.

As many as 36 species, or 64 per cent., occur both in Indo-China and in Malaya; as 15 pass southward to Australia while 14 pass northward to South China, and 5 pass southward to Malaya without going north to Indo-China, while 5 reach the islands from Indo-China without extending to Malaya, we may conclude that, though this element in the flora is distinctly non-Indian, the Indo-Chinese and Malay-Australian influences are, so far as it is concerned, evenly balanced.

Since the active agency in the dispersal of these species is that of

fruit-eating birds, it ought to be possible to show that the known migrations of these creatures sufficiently explain their distribution. For all the species that occur in the Malay Archipelago this is extremely easy to do. The western half of the Malay Archipelago is particularly rich in fruit-eating pigeons and, as this area lies on both sides of the equator, the annual changes of season must cause the fruit-eating species, following the fruits on which they feed as these become mature, to oscillate from side to side of the equator. The same condition will ensure further migration from Southern Malaya to North Australia and *vice versa* on the one hand, and from Northern Malaya to the Nicobars and Andamans and *vice versa* on the other. It is not necessary to suppose that any particular fruit-eating bird must range from one end to the other of the area here considered, though some species, like *Caloenas nicobarica*, which extends from these islands to New Guinea, nearly or altogether do so; it is sufficient to know that such birds are seasonal visitants in any given locality, as is true of *Carpophaga bicolor*, *Carpophaga insularis*, *Caloenas nicobarica*, and many other species in those very islands; the region depleted of one set of species by the migration of these towards the north is filled with individuals representing another set coming from an area still further south. By the necessary over-lapping of the ranges of migration of different birds a continuous chain of dispersal is kept up and, even if Malayan birds never go further north than these islands, the process is continued by the arrival from and departure to the opposite point of the compass, of Indo-Chinese species; it is therefore not surprising to find that, where the climatic conditions still continue favourable, the same bird-distributed species of *Phanerogams* extend from North Australia through all the intervening areas to Southern China. This being so, the appearance of the same species in India and in Malaya, which is the case in 33 species, or 58 per cent., of the group, is simply explained. Certain species of birds, instead of only passing southward from China to Indo-China, pass also south-westward to the Eastern Himalaya or to the Assam valley, from whence these, or other, species of birds carry the seeds of the plants in question still further south-westward into peninsular India. This may explain also why certain species, like *Pæderia foetida*, extend from Malaya northwards to Indo-China on the eastern line of migration, but on the western extend only southward to the Eastern Himalaya and not into India; the species of birds that eat their fruits may perhaps not migrate on the more western line of migration further south than the Himalayan slopes. The same reasoning applies to those species, of which there are 3, or about 5 per cent., that extend to Southern India on the western line of migration but do not go as far as Malaya on the

eastern line. The species that are common to these islands and to Ceylon are more difficult to explain. If we felt certain that they are species of distinctively Ceylonese type and that they occur, out of Ceylon, only in these islands, we might suppose that Ceylon birds are occasionally driven by storms as far as the Coco Group and consider the dispersal of the seeds of such species as one of the indirect sequels of cyclones of unusual severity. The birds even need not be different, as regards species, from those commonly found in the Andamans; they need only be individuals that have followed the western instead of the eastern line of migration southward, and that under exceptional circumstances have passed directly from one line of migration to the other, carrying in their crops seeds or fruits that are characteristic of the line of migration from which they have been driven. If the species are not of Ceylonese type, their occurrence both in Ceylon and the Cocos may, as has been said already, only indicate that they have been brought directly from Malaya or Australia by southern birds that migrate to Ceylon as well as to the Coco Group but do not go as far north as peninsular India.

The remaining sub-group consists of species with seeds or fruits that are eaten by birds of different kinds, not for the sake of any pulpy portion, but on account of the nutritious properties of the whole fruit or seed. We have to realize that the dispersal in this case is not, as in the case of pulpy fruits the seeds of which are afterwards voided, an ordinary circumstance, inasmuch as the seeds are eaten for their own sake and are of necessity digested by the birds that eat them. But though it is not perhaps a common occurrence—the numbers of migrating grain- or seed-eating individuals considered—for newly-arrived birds to be killed, there is no doubt that a certain proportion, tired out by their long flight, must fall victims to raptorial birds immediately on their arrival, the grains or seeds that their crops may contain falling aside and possibly germinating. Besides this means of introducing such species, and, even if the results be slight, it must nevertheless be in constant operation, there is the further possibility of similar species being introduced during severe cyclones, owing to birds that have been driven to land being captured and devoured, while exhausted by the buffeting of the tempest, by birds or beasts of prey. In this way not only the grain- or seed-eating species that ordinarily visit the islands, but species both of this and of the fruit-eating class that do not usually reach the group, may conceivably arrive and as conceivably bring with them the seeds of plants that birds which are normal visitants have no opportunity of meeting with or may not care to eat. It has to be admitted, however, that species for which this mode of introduction

is claimed may with some degree of reason be looked upon as distinctly, though indirectly, introduced by wind.*

The species for which this mode of introduction is conceivable are given below. That many of them *must* be introduced species their presence in Narcondam and Barren Island testifies; it is therefore, as regards these, somewhat on the principle of exclusion that they are referred to this class, and for some of them, such as *Abrus precatorius*, it is doubtful if it be not rather the sea that is responsible for their appearance.

TABLE XXIII. *Species perhaps introduced by seed- and grain-eating birds.*

SPECIES.					S. E. ASIA.				Australia.	Polynesia.	America.
					Africa.	India.	Indo-China.	Malaya.			
<i>Cyclea peltata</i>	...	...	...	...	—	x	x	x	—	—	—
<i>Abrus precatorius</i>	...	...	...	...	x	x	x	x	x	x	x
<i>Abrus pulchellus</i>	...	...	...	...	—	x	x	x	—	—	—
<i>Mucuna pruriens</i>	...	...	...	...	x	x	x	x	x	x	x
5. <i>Acacia pennata</i>	...	...	...	...	x	x	x	x	—	—	—
<i>Albizzia Lebbek</i>	...	...	...	...	x	x	x	x	x	—	—
<i>Albizzia procera</i>	...	...	...	...	—	x	x	x	—	—	—
<i>Ipomæa Turpethum</i>	...	...	...	...	x	x	x	x	x	x	—
<i>Pollia zorzogonensis</i> var.	...	...	...	...	—	—	[x]	x	—	—	—
10. <i>Commelina obliqua</i>	...	...	...	...	—	x	x	x	—	—	—
[<i>Aneilema ovatum</i>]	...	...	...	...	—	—	x	x	—	—	—
<i>Panicum colonum</i>	...	...	...	...	x	x	x	x	x	x	x
<i>Panicum Helopus</i>	...	...	...	...	x	x	x	x	x	—	—
<i>Panicum javanicum</i>	...	...	...	...	—	—	[x]	x	—	—	—
15. [<i>Panicum ciliare</i>]	...	...	...	...	x	x	x	x	x	x	x
[<i>Ischæmum ciliare</i>]	...	...	...	...	—	x	x	x	x	—	—
[<i>Eleusine indica</i>]	...	...	...	...	+	x	x	x	x	x	x
[<i>Dendrocalamus strictus</i>]	...	...	...	...	—	x	x	—	—	—	—

* That there is nothing extravagant in claiming this as a possible means of introduction, the following passage (which refers, as it happens, to one of the islands under discussion), will sufficiently prove:—"Mr. Hawkins told us that when "the storm was over * * * * * "every hollow of the island was tenanted by hundreds of numbed or wounded "sea-birds of all descriptions (such as he had never seen near the island before or "since) so terrified or exhausted that he picked up or took home several of them to "the light-house to show to his wife. Mixed with these were a certain number "of pigeons, parrots, and other land-birds, but the great majority were Petrels, "Terns, Whale-birds and such like sea-fowl with which his experience as a sailor "in southern seas had made him familiar. Most of these birds ultimately recovered "and left the island, but many of them hung about it for weeks, and for many "days remained so tame that they would not move from the ground or the rocks,

Of the above, *Cyclea peltata*, *Abrus precatorius*, *Acacia pennata*, *Albizia Lebbek*, *Albizia procera*, *Ipomœa Turpethum*, and *Pollia zorzogonensis* occur in Narcondam. With few exceptions they are widely distributed species; five are cosmopolitan, one extends throughout the Eastern Hemisphere and thence to Australia and Polynesia, two extend from Africa and Asia to Australia, one occurs in Asia and Africa, one in Asia and Australia; only eight species, or less than half of the group, are confined to South-Eastern Asia. Of these latter, three are confined to the countries east of the Bay of Bengal; two of them, *Panicum javanicum*, and the particular variety of *Pollia zorzogonensis* that occurs, are moreover distinctively Malayan, as opposed to Indo-Chinese, plants. On the other hand one species, *Dendrocalamus strictus*, is as distinctively an Indian or Indo-Chinese plant.

We have now in conclusion to consider the "remanent" species, a list of which is given in the subjoined table; in a few cases where introduction is remotely possible the agency that may have been responsible is indicated.

"where they happened to alight, to make way for the keeper or his men." (Hume; *Stray Feathers*, vol. ii, p. 113-4.)

In this passage we have all the evidence that is required to show that not merely the usual visitants but even unusual ones may at times be driven to, or seek shelter on, these islands when in an exhausted or injured condition, and to show that this is as likely to happen to grain-, pulse-, and seed-eating species as to fruit-, or fish-, crustacean- or mollusc-eating ones. It is of little moment that the fish- or crustacean-eating species must always be the more numerous, if we know that species of the other kind are at any time driven to the islands in this state. All of these exhausted and injured creatures certainly do not recover or escape destruction. As regards those that simply die, when the insects that abound have eaten all but their bones, the seeds that may have been contained in their crops must fall aside and may germinate and grow. And as regards those that are killed and devoured it would be remarkable if a few of the seeds in their crops did not thus fall aside and obtain an opportunity of germinating.

Even if no other creature that exists in these islands were capable of, or likely to, catch and eat such exhausted birds, the presence of a large lizard—*Hydrosaurus salvator*—which is very common, is sufficient to account for the destruction of many of them. During our visit to Little Coco one of the officers of the "*Investigator*" shot two *Carpophaga bicolor*—right and left—by the side of the lagoon near the south end of the island. Before his attendant could reach the birds, which had fallen among the *Pandanus* bushes of the sea-fence, one of these lizards had already eaten all but the wings and head of one pigeon and had torn open the breast of the second ere it could be interrupted in its feast. On a previous occasion a *Hydrosaurus* was killed as it was apparently about to seize a Teal that had just been shot and had been laid down on a rock in the same lagoon. On opening up this creature its stomach was found to contain already a large land crab, two fishes, and a quantity of grassy roots (apparently those of *Scirpus subulatus*).

TABLE XXIV. Possibly "Remanent" species of the Coco Island flora.

SPECIES.			S. E. ASIA.								Possibly introduced by
			Africa.	India.	Indo-China.	Malaya.	Australia.	Polynesia.	America.		
* <i>Miliusa</i> sp.	-	-	-	[x]	-	-	-	-	-	? Birds.
[<i>Cyclea peltata</i>]	-	-	x	x	x	-	-	-	-	
* <i>Antitaxis calocarpa</i>	-	-	-	[x]	-	-	-	-	-	
<i>Alsodeia bengalensis</i>	-	-	-	x	-	-	-	-	-	? Ocean.
5. <i>Dipterocarpus pilosus</i>	-	-	-	x	x	-	-	-	-	
<i>Dipterocarpus alatus</i>	-	-	-	x	x	-	-	-	-	
<i>Sterculia villosa</i>	-	-	x	[x]	-	-	-	-	-	? Ocean.
*[<i>Sterculia rubiginosa</i> var.]	-	-	-	[x]	-	-	-	-	-	
<i>Sterculia parviflora</i>	-	-	-	x	x	-	-	-	-	
10. <i>Sterculia alata</i>	-	-	x	x	x	-	-	-	-	? Birds.
<i>Sterculia colorata</i>	-	-	x	x	-	-	-	-	-	
<i>Sterculia campanulata</i>	-	-	-	x	x	-	-	-	-	
<i>Buettneria andamanensis</i>	-	-	-	[x]	-	-	-	-	-	? Birds.
<i>Berrya Ammonilla</i>	-	-	x	x	+	-	-	-	-	
15. * <i>Grewia calophylla</i>	-	-	-	[x]	-	-	-	-	-	
* <i>Canarium euphyllum</i>	-	-	-	[x]	-	-	-	-	-	? Birds.
<i>Amoora Rohituka</i>	-	-	x	x	x	-	-	-	-	
<i>Chicrassia tabularis</i>	-	-	x	[x]	x	-	-	-	-	
<i>Phlebocalymna Lobbiania</i>	-	-	-	[x]	-	-	-	-	-	? Ocean.
20. <i>Glyptopetalum calocarpum</i>	-	-	-	[x]	-	-	-	-	-	
<i>Siphonodon celastrineus</i>	-	-	-	[x]	x	-	-	-	-	
<i>Ventilago calyculata</i>	-	-	x	x	x	-	-	-	-	? Ocean.
<i>Parishia insignis</i>	-	-	-	[x]	-	-	-	-	-	
<i>Spondias mangifera</i>	-	-	x	x	x	-	x	-	-	
25. [<i>Dracontomelum mangiferum</i>]	-	-	x	x	x	-	-	-	-	? Ocean.
<i>Connarus gibbosus</i>	-	-	-	[x]	x	-	-	-	-	
<i>Pueraria Candollei</i>	-	-	-	x	-	-	-	-	-	
<i>Pueraria phaseoloides</i>	-	-	-	x	x	-	-	-	-	? Wind.
<i>Pterocarpus indicus</i>	-	-	x	x	x	-	-	-	-	
30. <i>Derris scandens</i>	-	-	x	x	x	x	-	-	-	
<i>Mezoneuron enneaphyllum</i>	-	-	[x]	x	-	-	-	-	-	? Wind.
<i>Adenanthera pavonina</i>	-	-	x	x	x	-	-	-	-	
<i>Acacia concinna</i>	-	-	x	x	x	-	-	-	-	
<i>Terminalia bialata</i>	-	-	-	[x]	-	-	-	-	-	? Wind.
35. * <i>Lagerstroemia hypoleuca</i>	-	-	-	[x]	-	-	-	-	-	
* <i>Lagerstroemia</i> sp.	-	-	-	[x]	-	-	-	-	-	
<i>Illigera conyzadenia</i>	-	-	-	[x]	-	-	-	-	-	? Wind.
* <i>Webera Kurzii</i>	-	-	-	[x]	-	-	-	-	-	
<i>Randia longiflora</i>	-	-	-	x	x	-	-	-	-	
40. <i>Diplospora singularis</i>	-	-	-	x	x	-	-	-	-	? Wind.
<i>Ixora grandifolia</i>	-	-	-	[x]	x	-	-	-	-	
<i>Ixora cuneifolia</i>	-	-	-	x	-	-	-	-	-	
<i>Strophanthus Wallichii</i>	-	-	x	x	-	-	-	-	-	? Wind.
<i>Argyreia Hookeri</i>	-	-	-	x	-	-	-	-	-	
45. <i>Argyreia lanceolata</i>	-	-	-	[x]	-	-	-	-	-	
<i>Lettsomia peguensis</i>	-	-	-	x	-	-	-	-	-	? Wind.
<i>Porana spectabilis</i>	-	-	-	[x]	-	-	-	-	-	
<i>Thunbergia laurifolia</i>	-	-	-	x	x	-	-	-	-	? Wind.
	...	-	-	-	-	-	-	-	-	-	

SPECIES.		Africa.	S. E. ASIA.			Australia.	Polynesia.	America.	Possibly introduced by
			India.	Indo-China.	Malaya.				
<i>Strobilanthes phyllostachyus</i>	—	—	x	—	—	—	—	
50. <i>Eranthemum album</i>	—	[x]	x	x	—	—	—	
<i>Peristrophe acuminata</i>	—	—	[x]	x	—	—	—	
<i>Bragantia tomentosa</i>	—	—	x	x	—	—	—	
<i>Loranthus longiflorus</i>	—	x	x	x	—	—	—	? Birds.
<i>Phyllanthus columnaris</i>	—	—	x	—	—	—	—	
55. <i>Cyclostemon assamicus</i>	—	—	x	—	—	—	—	
<i>Aporosa villosula</i>	—	—	x	—	—	—	—	
<i>Croton sublyratus</i>	—	—	[x]	—	—	—	—	
* <i>Blachia andamanica</i>	—	—	[x]	—	—	—	—	? Ocean.
<i>Claoxylon longifolium</i>	—	—	[x]	x	—	—	—	
60. <i>Mallotus acuminatus</i>	—	—	[x]	x	—	—	—	
* <i>Mallotus andamanicus</i>	—	—	[x]	—	—	—	—	
<i>Cnesmone javanica</i>	—	—	x	x	—	—	—	
* <i>Livistona</i> sp	—	—	[x]	—	—	—	—	
* <i>Corypha elata</i>	—	—	[x]	—	—	—	—	
65. * <i>Calamus andamanicus</i>	—	—	[x]	—	—	—	—	
* <i>Calamus tigrinus</i>	—	—	x	—	—	—	—	
<i>Alocasia fornicata</i>	—	x	x	x	—	—	—	? Birds.
<i>Scindapsus officinalis</i>	—	x	x	x	—	—	—	? Birds.
<i>Dendrocalamus strictus</i>	—	x	x	—	—	—	—	
70. * <i>Xylaria clavarioides</i>	—	—	[x]	—	—	—	—	

To the 67 unequivocal species of this list 3 other apparently local *Fungi* should perhaps be added; it is, however, extremely probable that when they are better known they will be found to exist elsewhere, in which case they might be added to the list of wind-distributed species; the proportion that results is therefore:—

Migrant sp: Remanent sp:: 4: 1.

It will be noted that not a single species which seems unquestionably "remanent" extends beyond South-Eastern Asia, and that the species which are here treated as such are only 67 in number, constituting no more than 20 per cent. of the flora. Of these species only 21, or 32 per cent., occur in India or Ceylon or both, and of these only one (*Sterculia villosa*) has not hitherto been found elsewhere to the east of the Sea of Bengal. This "remanent" section of the flora may therefore be looked upon as distinctly non-Indian. The point to be ascertained further is whether this element indicates more strongly an Indo-Chinese or a Malayan influence. Thirteen of the species, indicated in the table by an (*) occur only in the Andamans or Nicobars, while seven more occur only in Tenasserim on the opposite shores of the Andaman Sea. But Tenasserim bears to the Malay Peninsula and Indo-China very much the

relationship that the Andaman-Nicobar chain bears to Indo-China and the Malay Archipelago, and perhaps neither it nor the Andamans ought to be spoken of as physiographically a part either of Indo-China or of Malaya;* these 20 species cannot therefore be cited as indicating either an Indo-Chinese or a Malayan influence. The purely Indian *Sterculia villosa* must obviously be similarly excluded; there are therefore 21 species, or 32 per cent. of this group, that afford no evidence either way.

Of the remaining species, one-half, *i. e.*, 23 species, or 35 per cent. of the whole, occur both in Indo-China and Malaya; these also give no evidence as regards this question. Of the other 23, 15 extend from Indo-China to these islands (some of them, like *Dendrocalamus strictus*, not going further than the Coco Group), without extending to Malaya; while only 8 extend from Malaya to these islands without occurring in Indo-China. The "remanent" species, therefore, so far as this evidence goes, indicate the predominance of an Indo-Chinese element, a fact that is altogether in accordance with what we should expect from our knowledge of the configuration of the sea-bottom along the line of islands from Cape Negrais in Arracan to the Nias Islands and Sumatra.

Reviewing the results of the preceding paragraphs we conclude that 288 species, or 80 per cent. of the flora, may conceivably have been introduced: 33 species, or 9 per cent., by human agency; 9+ species, or 28 per cent., by birds; 60 species, or 17 per cent., by winds and 101 species, or 28 per cent., by the sea. We find moreover that the evidence is in favour of the bird-introduced species having, so far as those brought by wading- and water-birds are concerned, been introduced from the north, and so far as those brought by frugivorous and by seed- or grain-eating birds are concerned, having come in almost equal numbers from Malaya or the Andamans to the south, and from Indo-China to the north. So far as wind-introduced species are concerned the influence of the north-east monsoon is apparently the more active; so far as the sea-introduced species are concerned the influence of currents from Malayan seas to the south-east has been paramount.

The subjoined table gives a synoptic view of the probable origin of the Coco Island flora.

* The writer has proposed the name "Malay Isthmus" for the conjoint area that includes Tenasserim, the Andamans and the Nicobars, and believes that it will be found convenient to recognise this as a distinct phytogeographical subdistrict. See *Ann. Roy. Bot. Garden, Calcutta*, iii, 238.

TABLE XXV. *Synopsis of origin of Coco Island flora.*

Species possibly introduced, for the presence of which no former land connection need be necessary :—	288
Introduced by living creatures	127
By human agency ; (largely cosmopolitan species)	33
Intentionally ; (cultivated plants)	15
Unintentionally ; (weeds)	18
By birds, (perhaps also to a small extent by bats)	94
Attached externally to their bodies	25
Immediately ; (viscous- or prickly-fruited sp.)	9
By mud ; (species introduced by water-birds, mainly from the northward)	16
Carried in crops of birds ; (almost in equal proportion from northward and from southward)	69
As a natural sequence of their mode of life ; (fleshy-fruited species)	55
Accidentally, where bird must have been destroyed to admit of germination of seeds ; (by seed- and grain-eating birds) : [indirectly due to agency of wind]	14
By other natural agencies	161
By wind directly ; (sp. with seeds specialised for wind-carriage ; also small-spored <i>Cryptogams</i>)	60
By the sea ; (mainly Malayan species)	101
Marine species ; (mainly <i>Algæ</i>)	21
Littoral species ; (mangrove-vegetation and beach-forest species)	80
Species probably remanent and indicating former connection with adjacent land, (apparently Indo-China) :—	70
TOTAL of Coco Island species	358

Notes on some native Ephemeridæ in the Indian Museum, Calcutta.—

By THE REV. A. E. EATON, M. A., F. E. S., communicated by
THE SUPERINTENDENT OF THE INDIAN MUSEUM.

[Received 17th November, 1891 : Read 2nd December, 1891.]

The following notes concern a collection of 27 specimens of *Ephemeridæ* received from Calcutta in April 1889, comprising representatives of 10 species or 6 genera, viz.:—3 sp. of *Palingenia*, 1 of *Polymitarcys*, 1 of doubtful genus allied to *Hexagenia*, 2 of *Ephemerella* and 2 of *Epeorus*,—all of ordinary dimensions. From the absence of lesser species it may be inferred that these are the results of random